RADIO AND HOBBIES IN AUSTRALIA

LOOKING through this issue, we seem to have written a good deal about our new mantel set—the "Little General." If this is so, our enthusiasm for it is to be blamed. After several week's careful testing, we are convinced that it is "the goods."

When building the set we were prepared to make some sacrifices in such matters as sensitivity and output, in order to produce an inexpensive and easily made receiver. But our tests to date seem to indicate that after all, nothing much has been lost by reducing the circuit to the veritable A.B.C. of set-building.

After all, a set which will receive interstate B class stations at full loud speaker strength on a small aerial, cannot be classed as insensitive.

As for its clarity, especially on speech, we definitely prefer it to many larger mantel and table sets we have used during the last few months. The new set has been in almost constant use since we dropped the last blob of solder into place, and, so far, it hasn't developed a single weak point.

When a few of these have been built up, we are confident they will cause something of a sensation among radio people.

John Moyle

INDEX

RADIO KEEPS LAMPS ALIGHT ... 3
SCIENCE OF SIEGE GUNNER ... 7
HAVE WE BEATEN MAGNETIC MINES? ... 8
CAN NATURAL GAS DRIVE OUR CARS? ... 10
ARTIFICIAL LARYNX—WONDER OF SCIENCE ... 13
SCIENCE KEEPS IT COLD WITH DRY ICE ... 14
IT HAPPENED THIS MONTH ... 16
HUMPERDINK CARTOON ... 17
TECHNICAL EDITOR'S WORLD REVIEW ... 18
A.V.C. IN THEORY AND PRACTICE ... 20
ELEMENTARY RADIO COURSE ... 22
THE SERVICEMAN WHO TELLS ... 24
"THE LITTLE GENERAL" ... 27
MORE ABOUT ELECTRIC FENCES ... 38
THE "TINY TWO" BATTERY SET ... 42
TRADE NOTES AND NEWS ... 49
SHORT WAVE NOTES—RAY SIMPSON ... 52
PHOTOGRAPHY PAGES ... 60
MAGIC AND MAGICIANS ... 62
CANNON ARMAMENTS FOR ALLIED PLANES ... 66
MODEL FLYING PAGES ... 68
A SIMPLE SICK-BED TABLE ... 73
MAKING YOUR OWN LINO-CUTS ... 74
WORKSHOP HINTS ... 76
ANSWERS TO CORRESPONDENTS ... 78

☆

RADIOTRON VALVES are supplied in factory-sealed cartons — YOUR guarantee that the valve you buy is new. The carton must be destroyed to remove the original valve . . .

For more enjoyable radio entertainment

☆

Revalve with

RADIOTRON VALVES

★ SEALED FOR YOUR PROTECTION

Advt. of Amalgamated Wireless Valve Co. Pty. Ltd.

PUBLISHED BY ASSOCIATED NEWSPAPERS, LTD., AT 60-70 ELIZABETH-STREET, SYDNEY. Phone BO 333, Box 2728C, G.P.O., Sydney

ADVERTISEMENT

SPECIAL OFFER

These two famous books, which every radio service man will find invaluable, are now offered together for 45/—a reduction of almost 15 per cent. Written by A. A. Ghirardi, one of the world's foremost radio authorities, they are full of sound, practical advice on every phase of radio servicing; they will help you solve the problems you meet daily. At this special price of 45/- for the two they are exceptionally keen value. GET YOUR COPIES NOW.

2 BOOKS THAT GIVE YOU—*All the Answers*

RADIO TROUBLE-SHOOTERS' HANDBOOK

A NEW KIND OF SERVICING HANDBOOK—Never before has there been a book like Ghirardi's new Radio Trouble-Shooters' Handbook. It is outstandingly different from any servicing book or manual you have ever seen or used. Nowhere else can you obtain all the helpful factory-checked data and information contained in this single volume!

MODERN RADIO SERVICING

1300 pages of practical information on every phase of radio servicing. Every modern test instrument and method clearly described and explained. Complete details on the theory, construction, and operation of all forms of test equipment, circuit diagrams, construction data, etc. Latest test and repair methods; receiver analysis, A.V.C. and Q.A.V.C. circuits, etc.

ORDER FORM

Angus & Robertson Ltd.,
89 Castlereagh Street, SYDNEY.

☐ *Please send me Chirardi's "Modern Radio Servicing" and "Radio Troubleshooter's Handbook" for which I enclose 8/6 deposit and agree to make four further monthly payments of 10/- each (total 48/6, + 2/- for postage). The price for cash within 30 days is 45/-, + 2/- postage.*

☐ *Send me "Radio Troubleshooter's Handbook," price, 22/6 (post 1/3).*

☐ *Send me "Modern Radio Servicing" for which I enclose 12/6 deposit and agree to make two further monthly payments of 10/- each. Cash price is 30/- (post 1/3 extra in each case).*

NAME ..... *ADDRESS* .....

BUSINESS ADDRESS ..... *OCCUPATION* ..... R. & H. APRIL

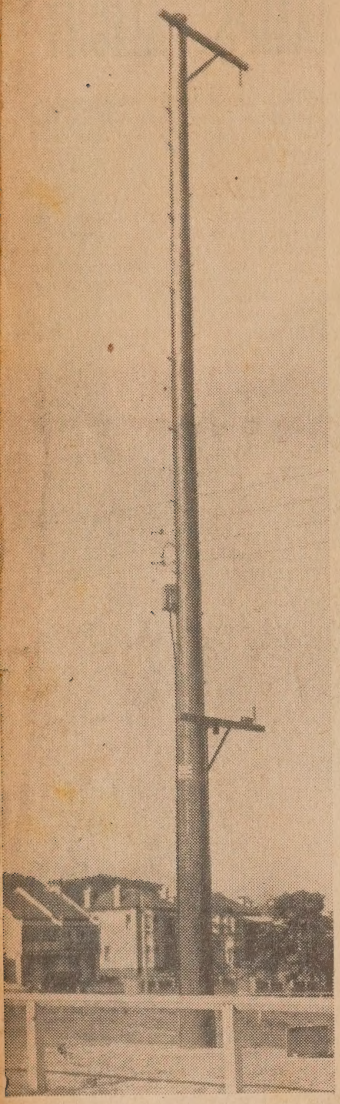
RADIO KEEPS YOUR ELECTRIC LAMPS ALIGHT

THE biggest news for the last hundred years has centred round the growth of communication. Slowly but surely, man has taken down the barriers of time and distance. Civilisation and science have advanced with the rise of radio, the telegraph, the aeroplane, the fast ocean liner. In this issue "Radio and Hobbies" tells you how radio is used to maintain a vital service in the life of our great city—Sydney's Electric Power Supply. It is the first in a series of exclusive articles written by Wm. A. Stewart.

SYDNEY'S POWER SUPPLY SAFE

WITH MARVELLOUS RADIO SYSTEM

The great majority of you who receive your radio entertainment from the regular broadcast and short-wave bands are probably not aware that just below the broadcast band there are quite a number of radio telephone networks, which perform extremely valuable work in maintaining essential services, and are in continuous operation 24 hours a day. One of the most interesting is that maintained by the Sydney County Council Electricity Undertaking. Here is the story surrounding "VKK," as it is known.



One of the receiving aerials scattered at strategic points round the city and suburbs. The aerial is strung vertically between the cross-arms on the pole. The receivers are housed, some underground, and some in special cabinets, at the pole itself, and feed the signal to the control officer's panel. When transmissions are made from a car, the receiving aerial is selected which gives the best results. About half-a-dozen of these aerials are in use.

EVERY time you turn an electric switch in your home, and so make use of the many and varied services electricity makes possible, have you ever stopped to think just what an amazing service there is back of this simple action? Black-outs are so rare that when one does occur it is news.

To make this service so efficient, a large number of men are employed day and night. Whether you are waking or sleeping, it is their responsibility to see that the area serviced by the County Council is free from interruptions to the supply, and on the rare occasions that a breakdown does occur, that the fault is remedied with a minimum of delay.

No doubt most of you have observed the businesslike trucks of the County Council, but have probably never given a thought to just what a useful service they perform.

FORTY-FIVE TRUCKS

A glance at our map shows the area served by the council. Forty-five trucks are continuously on the move, checking, testing and maintaining the enormous amount of equipment including substations, transformers, switches and cables so necessary for the reticulation of the current into your homes, factories, hospitals, shops and offices.

Apart from the maintenance work required in connection with the system itself, there is also quite a good deal of work in connection with customers' complaints.

The men on the job are divided into two categories. Firstly, there are 16 district operators, whose responsibility it is to maintain, check and carry out routine testing on such items as high and low voltage lines, substations, transformers, switches, and all the many and varied items that go to make up a complete electricity distribution system.

These district operators also take care of major troubles, which might affect a considerable area, whilst the work of the others is of a more local nature.

By . . .

Wm. A. Stewart

The balance of the men are concerned among other things with the rectification of complaints from individual consumers, such as factories, shops or private residences.

Now that we have some idea just what these officers are called upon to do, it is fairly obvious that speed is the all-important factor, and some ready means is necessary for keeping in touch with these men in the field.

RADIO SUPPLEMENTS TELEPHONE

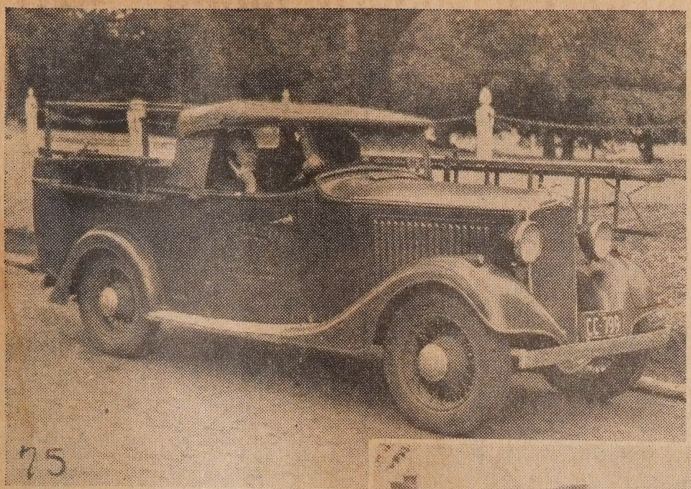
Until about 18 months ago communication was maintained over the telephone lines, the men telephoning the system operation branch from time to time during the day, usually from the various substations in their area. This was fairly satisfactory, but once a man received his instructions and proceeded on a job it was some time before this man could be again contacted. On many occasions it was found that a man might telephone from a particular point and be sent to some other locality, and that a few minutes later a need might arise for him to return to the place that he had just left.

With a view to overcoming these difficulties, it was only logical that the use of radio should be considered. Considerable investigation took place, and the outcome was the installation of the most complete and comprehensive two-way radio telephone installation, known as "VKK."

WHAT IS VKK?

VKK and its associated mobile transmitters and receivers is the system operated by the Sydney County Council Electricity Undertaking, and a most unique and efficient communication network it is indeed.

The entire installation comprises a main transmitter located at Pennant Hills, having a power of 200 watts, and remotely controlled from the system control room at the Queen Victoria buildings, six automatic receivers located at various points around the suburbs, as indicated on the map, and



One of the radio-equipped trucks. A vertical aerial is installed at the rear of the truck. The driver is seen using his telephone hand-set.

45 trucks each fitted with a radio telephone transmitter having a power of 10 watts, and a six-valve super-heterodyne receiver.

THE CONTROL DESK

This is the focal point of the complete system, and is located in the system control room, at the Queen Victoria Buildings in George-street, Sydney.

This system control room is the nerve centre of the whole Electricity Undertaking, and from this point, by means of a most complex switching system, any desired information regarding the operation of the entire system can be had at a moment's notice. A truly remarkable automatic switching system is installed, which gives a clear visual picture of just what is happening at any point over the area served by the undertaking. Troubles which occur are immediately registered by means of flashing lights and other signals, so that the entire operation of the system can be seen at a glance.

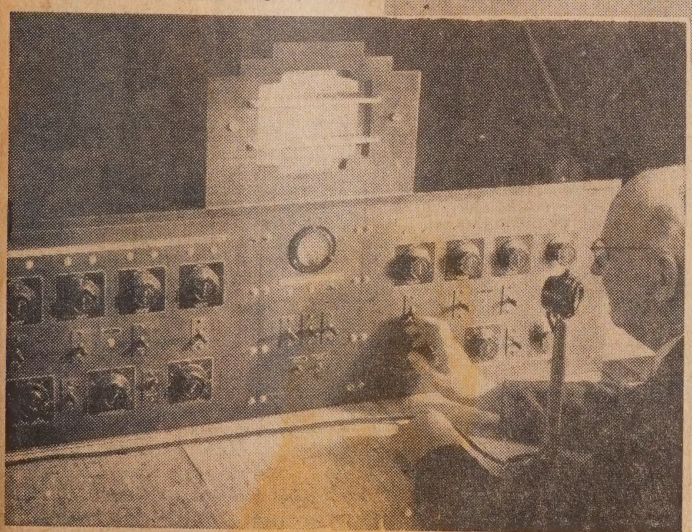
This room is also the terminal point of a most complete automatic telephone system, which works side by side with the radio installation, so that this is the logical point for the control of the radio network.

SIMPLE DESIGN

The control desk comprises a microphone and Morse key, a neophone type handset loudspeaker, and all the associated switching equipment for the transmitter, and the remotely controlled receivers.

The design of this control desk is simple in the extreme, and a comprehensive visual signalling system makes for ease of operation.

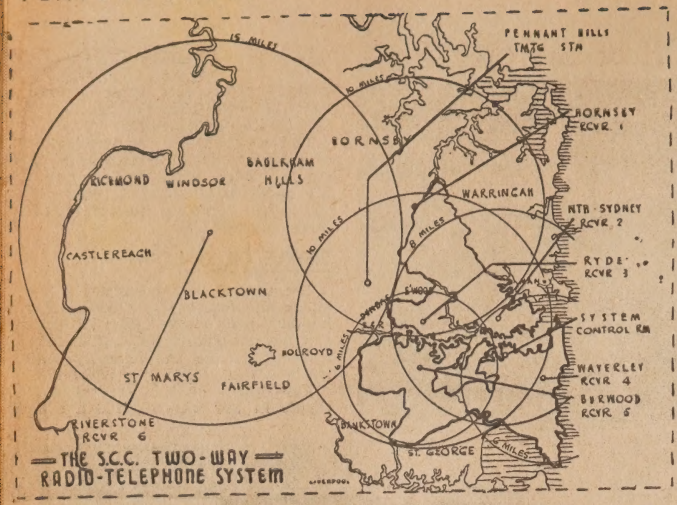
These strange looking affairs are entrances to underground sub-stations. The man shown in the picture has just answered a radio call.



Control desk in Systems operation branch.

It is to this point that all messages for transmission to the cars are passed, and here all messages from the cars are received.

At any hour of the day or night you can hear a quiet-voiced operator saying in a conversational tone, "VKK, to District Operator Doe, proceed to 465 Blank-street, Pymble—no light," and District Operator Doe replies, "O.K." A few minutes later, "District Operator Doe to VKK—all O.K. at 465 Blank-street." And so it goes on. Not only are council messages handled, but the speedy green trucks of the undertaking have been responsible for the calling of ambulances in connection with street accidents, and for giving fire alarms and a host of other messages, dealing with



This map shows the effective receiving area for each of the radio-equipped trucks. They all operate on 94.4 metres.

matters observed in the course of their day's work.

MAIN TRANSMITTER

The main transmitter, as mentioned above, is located at Pennant Hills, and is connected by landline and remotely controlled from the system operation branch in Q.V. Building.

This transmitter operates on 140.8 metres, has a power of 200 watts, with 100 per cent. modulation. The transmitter is, of course, crystal controlled, for stability of operation.

The control desk, pictured here, is connected by some 12 miles of telephone line, and remotely controls the transmitter proper.

From this control desk it is possible to switch the transmitter on and off, and transmit either by means of speech or Morse.

At the control desk there is a microphone of the pedestal type, and also a handset transmitter and receiver. Normally, the regular microphone is employed, and the messages are received per medium of the loudspeaker. Should privacy be required or if static is bad, the handset may be used, and messages sent or received just as is done over a conventional telephone line.

RECEIVING EQUIPMENT

The receivers are interesting, and, altogether, there are six of them, located at strategic points in the area served by the Undertaking.

Here, again, the receivers are automatic in their operation, and are crystal controlled. They are located in council property at Hornsby, North Sydney, Ryde, Waverley, Burwood and Riverstone. Vertical aerials are employed, and in the case of one receiver it is located in a pit at the foot of the pole. These receivers are remotely controlled, and due to their automatic operation there is no necessity for an operator to be in attendance.

The output from each receiver is fed to the control desk, and by a system of key switches it is possible to select the particular receiver on which the best reception is being obtained. These receivers all operate on 94.4 metres, which is, of course, the wave-length on which the cars transmit.

You will notice that on the map a circle has been drawn around each receiver, which is its effective area under normal conditions.

The receivers are superheterodynes, employing 10 valves, and are operated on A.C., although designed for A.C. or D.C. operation, and may be switched on or off from the control panel.

You will notice that the effective areas of the receivers overlap, so that, should a fault develop, reception will be possible from at least one of the other receivers.

MOBILE UNITS

The units in the trucks are also of interest, as many novel features are employed. The whole of the equipment, comprising the transmitter and receiver, is mounted on a tray, which slides into the back of the vehicle, and a remote control panel is mounted in the right-hand glove box of the vehicle.

The transmitter has an output power of 10 watts, and this is fed to a rectangular aerial mounted at the rear of the vehicle, while a vertical aerial is used for reception by means of the six-valve superheterodyne receiver.

The transmitters with this aerial have an approximate range of 10 miles, but this range varies considerably, depending on conditions.

An emergency aerial, consisting of 40 feet of wire, together with insulators and means for fastening it to a pole, is also carried, and good reception has been obtained up to 40 miles. This aerial is very useful in the Penrith-Richmond-Windsor district, when conditions are bad. Should the Riverstone receiver be out of commission at any time it also gives sufficient range for efficient reception and transmission through Hornsby, Ryde or Burwood receivers.

AUTOMATIC SIGNALS

Provision is made on the vehicle transmitter by depressing one of the two keys for the transmission of two automatic Morse signals, one indicating that the message has been received, and the other asking for a repeat.

The operation of these units is simplicity itself, and conversation is carried on just as over an ordinary telephone. In fact, an ordinary telephone handset is used for transmission and reception. The receiver is also fitted with a loudspeaker, so that when the officer is working around his truck he can hear any messages that may be transmitted.

The writer was privileged to spend some time observing at first-hand the actual operation of that most comprehensive installation, and was immediately struck by the ease in which communication was maintained. The system operates continuously 24 hours per day, and it is quite common for anything up to 200 messages to be handled in this time. One item which impressed me was the wide diversity of traffic which was handled from simple complaints, such as a customer's report that her lights would not light, to major jobs, calling for the attendance of more than one officer.

HOW IT WORKS

The men who use this system regard it simply as a telephone, and expect, and do obtain, the same degree of smoothness that we have come to expect from the telephone service. The radio system has not supplanted the telephone network, which is most complete, but has become a most valuable adjunct to this service.

Now for some of the work performed by these men; here are some items, taken at random from their official log:

"At 7.33 p.m. on December 3 last, Sydney Hospital reported 'no supply.' District Operator Morgan was called from William-street, Sydney, to attend. He

Continued on Page 77.

THE IDEAL RECEIVER

WHAT is the most popular type of receiver? If you were looking through radio journals, to pick out the set you would really want to build, what type of set would it be? We are anxious to know, because we want to describe such a set in "RADIO AND HOBBIES." Will you write to the Editor, and tell him what you think the ideal set should be? Remember that we are anxious to show you how to build the sets you want most. From your letters, we will be able to select the most popular features, and include them in a new design.

SCIENCE of the SIEGE GUNNER

PATH OF SHELL OR TRAJECTORY IS A PARABOLA
Engine-sound may be 4 miles
Observing Aeroplane
STRIKING VELOCITY 1000 ft. per second
MUZZLE VELOCITY 5000 ft. per second
Intervening High Ground gives Cover
Angle of Elevation
Angle of Descent steeper than Angle of Elevation
← RANGE →
BATTERY
TARGET

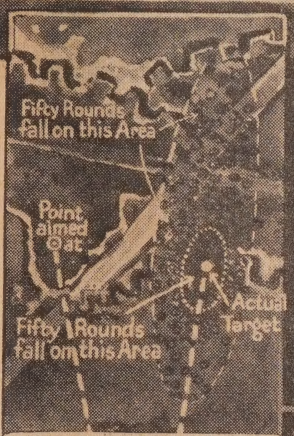
MODERN warfare with its lavish use of concrete fortifications calls for enormous quantities of high explosive for the destruction of the concrete works of the enemy.

This can best be thrown at them by gunfire, more especially from guns of the howitzer type, which are designed for high angle fire.

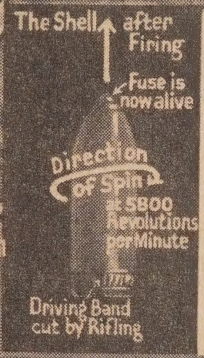
In destroying heavy emplacements this is a great advantage, because added destructive power is provided by the steep angle at which the shell falls.

The howitzer is a short type of gun, of no great power, that fires its projectile upwards, as distinct from the high-velocity gun that throws its shell as nearly straight at the target as possible.

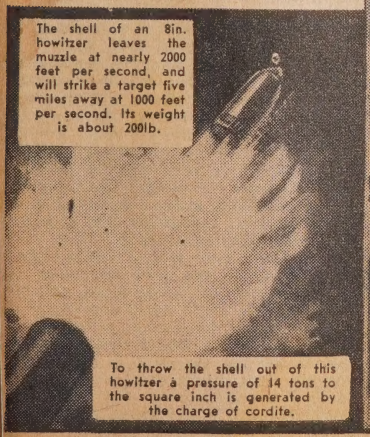
(Continued on Page 75.)



One hundred rounds are fired from a fixed gun, and the diagram above and below explains how the shells fall in two oval areas, fifty in a wide area, and fifty smothering the target.

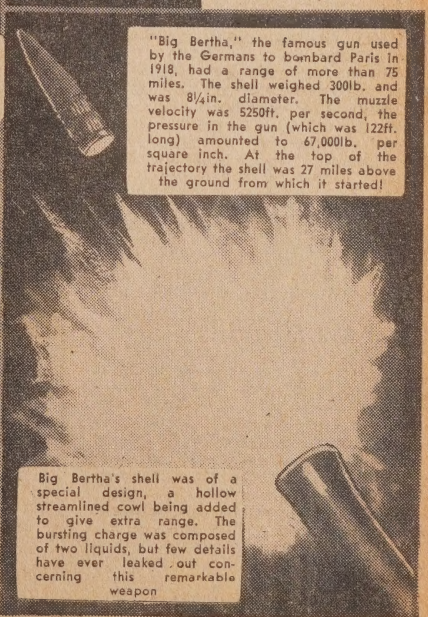


The shell in flight is given a spin by the rifling inside the gun, to keep its flight true. The spin given to an 8in. shell may be only one turn in 20ft. travel, but it is spinning at 5800 revolutions a minute. This rotation releases the safety catches inside the fuse, by centrifugal action, and renders it fully sensitive, so that the detonator is set off immediately the shell strikes its objective. Note in the picture how the rifling has cut the copper driving band. This driving band is put on, not only to give the shell the necessary spin, but also to seal the bore against possibility of escaping gas pressure.



The shell of an 8in. howitzer leaves the muzzle at nearly 2000 feet per second, and will strike a target five miles away at 1000 feet per second. Its weight is about 200lb.

To throw the shell out of this howitzer a pressure of 14 tons to the square inch is generated by the charge of cordite.

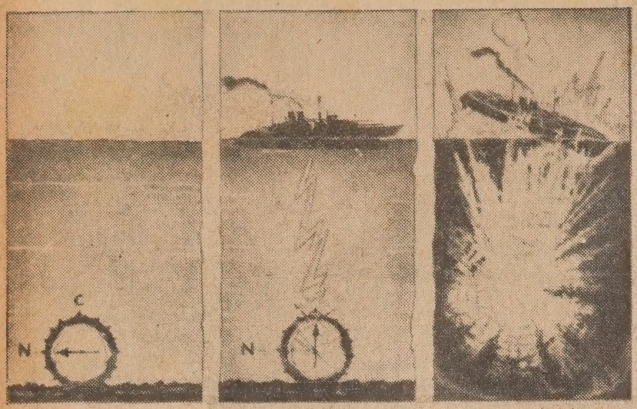


"Big Bertha," the famous gun used by the Germans to bombard Paris in 1918, had a range of more than 75 miles. The shell weighed 300lb. and was 8¼in. diameter. The muzzle velocity was 5250ft. per second, the pressure in the gun (which was 122ft. long) amounted to 67,000lb. per square inch. At the top of the trajectory the shell was 27 miles above the ground from which it started!

Big Bertha's shell was of a special design, a hollow streamlined cowl being added to give extra range. The bursting charge was composed of two liquids, but few details have ever leaked out concerning this remarkable weapon

FEATURE STORY

HAVE WE BEATEN THE MAGNETIC MINES?



How the magnetic mine works. The first picture shows the mine lying on the sea floor, with the needle horizontal. Next we see the needle attracted by the ship to an upright position. Finally, there is the xplosion.

Hailed by many as Hitler's "secret weapon," the magnetic mine has been the subject of tremendous interest by the Admiralty and the public, since first its use by the Nazis was detected. A magnetic mine is one which is exploded by the metal hull of a ship actuating its mechanism, which is magnetically operated. Direct contact with the ship itself is not necessary, as with the old-type contact mine.

By JOHN MOYLE

NEWS of the month, however, has been created by the new Cunard liner, Queen Elizabeth, which made a secret Atlantic crossing equipped with a revolutionary device to combat the magnetic mine.

It is claimed that by the use of the device, a metal ship is rendered immune from the magnetic mine danger.

Naturally, the exact details of the system are a close secret, but we have been told that an electrically charged cable running round the outside of the hull is the essence of its success. When so equipped, it is explained, it allows the ship to pass within the danger area with perfect safety.

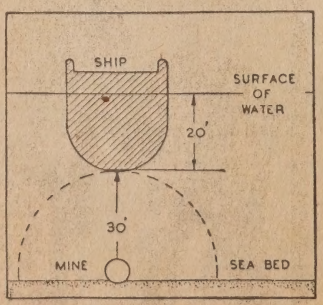
WHAT IS A MAGNETIC MINE?

The essence of the magnetic mine, as shown by our diagram, is a "compass" needle inside the outer case, which normally rests horizontally. As long as there are no iron or steel bodies in its vicinity the needle maintains this position, and the mine remains a potential source of danger.

Contrary to general opinion, it is reported that the magnetic mine is not as a rule used in deep water, and anchored by a cable, as in the case of the contact mine.

It is laid in shallow water, so that it rests on the bottom of the sea. Only when a ship passes near it will it explode. Naturally, to lay such a mine in deep water would be waste of time, as it would be too far from the hulls of the ships to be dangerous.

However, should a ship come within its range, the magnetic needle is deflected from its normal position, and tends to change position so that it points towards the hull.



This diagram shows the approximate range of the magnetic mine.

When the ship is approximately over the spot where the mine is lying, the needle, being upright, actuates a firing mechanism, and explodes, taking the ship with it.

MAGNETIC CASE

Naturally, the outer case of the mine itself cannot be made of a magnetic metal, which would act as a shield for the needle inside. It is therefore, made of aluminium or some similar alloy.

The mines contain explosives estimated as weighing about 700 pounds, and are the type which have been dropped from aeroplanes, or lowered with parachutes.

The mines will explode by contact, should they stroke some solid object as they fall. The contact mechanism, however, is comparatively insensitive, otherwise the mines would explode as they struck the water, or the bottom of the sea.

The operating depth of the mines is estimated as being about 50 fathoms maximum, so that only selected areas can be mined with much hope of success.

An interesting sidelight on these mines is given in the news. It has been revealed that some of them bear the date 1938, indicating that they had been prepared possibly two years before war broke out.

THE NEW DEVICE

It is not altogether clear just how the new protective device operates in theory. It is technically known as a "de-gaussing" equipment, and it apparently destroys the effect of the magnetic flux of the mine.

The effect of passing a heavy current through a cable surrounding the ship would, in effect, place it in a magnetic field which such a process would create.

Thus, instead of being simply an inert mass of metal, which would attract the needle in the mine, its own magnetic field would not have such a simple attractive effect on the needle which operates the mine's mechanism.

Evidently the net result is to prevent the needle from assuming its upright position as the hull passes over it.

Being in the Northern Hemisphere, such a needle, if freely swung, would tend to lie with its north pole uppermost, the south pole pointing downwards towards the earth's north magnetic pole. Light springs would be required to check the needle, and keep it horizontal when at rest.

If the ship were magnetised so that the bottom of the hull was also a "north," it would tend to repel the tip of the needle in the mine, and actually push it further downwards, rather than attract it upwards. Under those circumstances, the ship would pass unharmed over the mine, which could not possibly be fired under those circumstances.

Whether this is the actual theory on which the operation is based is hard

to say. However, it is the only one which occurs to us, in the absence of further information. It is hard to see how the ship could be protected as outlined, were this method not made use of in one way or another.

For, as the mine itself is operated magnetically, the only way in which the needle could be prevented from functioning as designed would be to counteract it with another magnetic force of sufficient strength.

METAL EQUALS WOOD

Another suggestion which has been made to explain the operation of the new equipment is that, in effect, it is so adjusted as to counteract the various magnetic fields which would exist in a metal ship, so that the hull ceases to attract a magnetised needle.

Strictly speaking, a ship is not a completely inert mass considered magnetically. It has a large amount of electrical equipment on board, which must cause the hull to assume definite, if complex, magnetic character.

Again, there is the hull's own magnetic structure which it assumes while being built.

The effect of working with steel, while the structure remains in the same position as regards the earth's field, will cause it to take on certain magnetic characteristics. It is well-known that if a steel bar is placed so that it conforms with the earth's magnetic field, and is then struck with a hammer, it will become mildly magnetic as its particles take up a position which will bring this about.

Then, of course, the fact that the ship is in the earth's field when sailing along, will cause it to assume a magnetic character.

The name, "degausser," as applied to the new idea, has led some to believe that the field set up by the current in the cables is so adjusted to cancel the total effect of all these things.

In such a case, it is argued, the ship would cease to attract a magnet at all, and to all intents and purposes, it would be the equivalent of a wooden or non-magnetic hull.

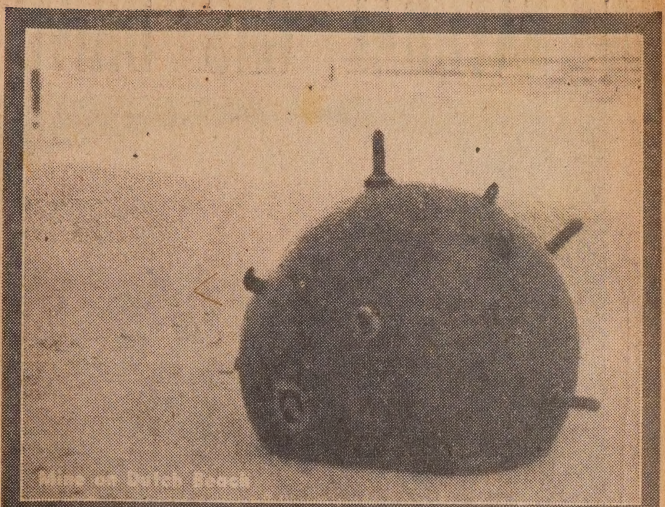
MANY THINGS INVOLVED

It should be pointed out that the whole matter is by no means a simple one, and involves many things which could only be worked out by expert brains, and considerable experiment. However, it is difficult to imagine that such a negative principle could be made as efficient in practice as one which definitely set out to counter-act positively the effect of the magnetic field round the needle in the mine.

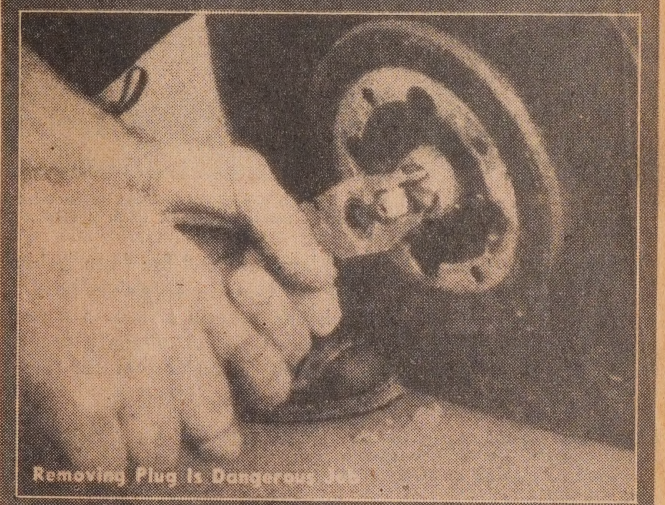
And again, it seems almost inconceivable that such simple solutions should not have occurred to the makers of the mines.

It is not even impossible that the whole story may have been given a prominence it does not deserve.

At the same time, it is a fascinating problem on which to exercise one's imagination. And if the results are all that is claimed we can only be thankful that this, at first sight, diabolical invention has been rendered innocuous.



Mine on Dutch Beach



Removing Plug Is Dangerous Job

Preparing to Explode It

FEATURE STORY

CAN NATURAL GAS DRIVE MOTOR CARS

An echo of the last war. Here is one of the first cars to be fitted in England with a "gas bag." The bag contains ordinary coal gas which is used to drive the engine.

Australia's fuel problems are still far from being solved. Although no rationing steps have yet been taken, prices have risen, and future action is uncertain. This is the second article in a short series covering the various alternatives with which Australia is faced. The position is outlined as fairly as possible, in order that our readers may better understand it.

IN our last month's issue we discussed producer gas as a substitute for petrol for running of cars, trucks and tractors.

You will remember that mention was made that this month we would discuss the possibilities of using natural gas and coal gas in a similar manner.

As far as is known, there is only bore producing natural gas and this is located in the old Balmain colliery at Sydney. The geological formation is such that this area is an ideal spot for gas of this type, and whilst this is the only bore operating there are no doubt many more areas where this gas could be found, but the advantage of the Balmain site is that the coal mine, which has since been abandoned as a producer of coal, descends to a great depth, thus reducing the depth to which the bore had to be sunk.

METHANE GAS

The gas produced at this location is known as methane, and has high calorific content of 1100 to 1200 British thermal units per cu. ft.

The amount of gas available at present is limited, and this bore can be regarded only as an experimental one.

The gas has been used successfully by various companies such as Mort's Dock, Cockatoo, and Garden Island for welding and cutting of steel, a purpose for which it is extremely suitable.

Regarding the use of this gas for the propulsion of cars and trucks, there are quite a number of technical difficulties which have to be overcome. In the first place, containers are necessary and these are naturally weighty and bulky. The gas would have to be compressed into cylinders similar to those employed for holding oxygen and other gases.

The usual practice is to compress the gas to about 2000 pounds per square inch. To get reasonable range from the vehicle seven cylinders would be necessary, and these would weigh between one and two hundredweight. Apart from the space which they would occupy, this additional weight has to be carried, with the consequent reduction in the efficiency of the vehicle. This would not be a very serious obstacle in the case of a commercial vehicle, but from the viewpoint of the private car presents a more pressing problem.

One of the major difficulties is the design of a reducing valve to reduce the pressure of the gas down to atmospheric pressure. This valve must be so designed that it will automatically close at atmospheric pressure when the engine is switched off. This presents quite an engineering problem, but is not incapable of solution. If the demand was great enough, quite a number of engineering firms would be capable of producing this equipment.

COMPRESSING PLANT

For the purpose of compressing the gas, a compressing plant would be necessary, and the cost of such a unit would be in the vicinity of £4000. At least two would be necessary for a city the size of Sydney. The distribution problems would also have to be solved, and provision made for obtaining the gas at convenient places throughout the State.

Instead of compressing the gas, it can be carried in a gas bag at atmo-

spheric pressure. Many illustrations have appeared from time to time showing cars fitted in the manner in use in other parts of the world.

This method also has disadvantages, as a valve is still necessary which will shut off at atmospheric pressure when the engine is stopped, but the main disadvantage in this system is that the amount of gas that can be carried is relatively small, in fact, only equal to a little over a gallon of petrol, which would mean refilling every twenty-five miles or so. This would be inconvenient to say the least.

GAS EFFICIENCY

The efficiency of gas as compared with petrol is about 88 per cent., which is better than the efficiency of producer gas, and presumably similar methods can be adopted to improve the engine efficiency to make up for the loss in power.

It would appear from information available that the cost of converting a vehicle to run on gas would be, at the present time, in the order of £150. This is considerably more than a conversion to producer gas, but it is likely that mass production methods would also help to reduce this cost to a more reasonable figure.

In summing-up, it would appear that gas can be employed to drive a vehicle in place of petrol, but it would seem that it does not offer a very attractive substitute, not only from the viewpoint of cost, but because of the other factors mentioned, such as bulk of the necessary gear, and also for the reason that refuelling would be necessary more frequently than is the case with petrol, or with a producer gas plant.

PRODUCER COMPARISON

Contrasted with producer gas, as we mentioned last month, this is not only a wartime substitute, but is quite a logical fuel owing to our supplies of timber, and also for the ease with which charcoal can be produced whenever it is required. On the other hand, gas seems to be a different proposition, and would only be used in the event of a terrific increase in the price of petrol, and certainly those who did change over would undoubtedly change back to petrol at the first opportunity.

It should also be remembered that in the event of considerable increase in petrol prices, or if restrictions are imposed, the private motorist will simply not use his car, but commercial users of trucks and tractors who must maintain their regular services may look around for something to replace petrol. I am of the opinion that their first consideration would be the producer gas plant, and that unless the gas operated plant can be made more attractive, it does not seem that this substitute will prove very popular.

A considerable amount of research work has been carried out by engineers of the Australian Gaslight Company, and we understand that they have fitted experimental equipment to a few of their own trucks. The results of their investigations are not yet available, but it is hoped that we will have some information from them for inclusion in a later issue.

One of the large cocks controlling the flow of methane gas at Balmain.

Television Used For Sky-Searchin

Television has come to the aid of astronomers studying the sun and may soon help communication engineers to forecast radio blackouts on transatlantic transmissions, according to Dr. A. M. Skellett, of the Bell Telephone Laboratories.

Special television apparatus has been devised for use with telescopes to scan the sky around the sun at any time without waiting for a total solar eclipse. Only at times of total eclipses have astronomers previously been able to investigate the solar flares and prominences. Expeditions have travelled thousands of miles in the past for a brief, fleeting look at the eclipsed sun.

FORECASTING CONDITIONS

What radio engineers hope is that by daily inspections of the solar activity in the corona they may be able to forecast better the disruptions in transatlantic radio transmission. While a few years ago transatlantic radio was little known to the public, the growing demands for European broadcasts of the war have brought its merits, and upon occasion its trouble with blackouts, to the listening public.

The new apparatus, tested successfully at the Cook Observatory at Wynnewood, Pa., is used in connection with a horizontal telescope which throws its image against a screen. A mirror on this screen, just the size of the image of the sun's disk, reflects this useless glare down into a light trap. The desired image of the corona and its features passes on and is caught by a television camera which is sensitive only to the alternating current compone that originates in the corona. T direct-current component, found in t glaring disk, is rejected.

HOW IT WORKS

The television apparatus amplif the alternating-current component a reproduces from it an image of t corona. The televised image appe on the screen of a cathode ray tube.

Many images of the solar promi ences have been obtained, Dr. Skell indicated, and a number of other fe tures which are apparently of coron origin have been seen.

"On one particularly clear day," said, "a bright jet or flare in t corona was photographed over a peri of several hours. This feature turn about the optic axis of the telesco with time at the correct rate for coronal feature."

STORING THE SUN'S HEAT

AN experimental house designed trap the sun's heat falling on t roof and store it in the basement f future use is ready for research on t utilisation of solar radiation at t Massachusetts Institute of Technolog

The Magazine for People with a Hobby

Model 'Plane Builders

AMATEUR PHOTOGRAPHERS

STAMP COLLECTORS

SCIENCE & INVENTION

CHESS, GAMES, ETC.

WHATEVER your hobby there's a "World's News" feature to interest you. The "World's News" is the only New South Wales publication that informs you of the doings of model aeroplane organisations. It gives as well, particulars and plans of new models, hints on construction and is conducted by a well-known enthusiast in the sport. Amateur photographers and stamp collectors will find the sections conducted for them packed with interest, and the science and invention feature is a mine of information and handy hints for mechanics, motorists, engineers, gardeners and homemakers. Gregory Koshnitsky, chess champion of Australia, regularly provides a fascinating page for players, and there are features devoted to draughts, crossword puzzles, &c. The seeker for information in medicine, foreign affairs, travel, science, detection, will find pages of fascinating reading, because the "World's News" specialises in unusual articles about these subjects.

FICTION TOO

Every short story and serial published in the "World's News" has been chosen from scores submitted. You will find every week tales with a spice of adventure and more than a dash of action. That's how it earned its reputation as "Australia's best mgazine of fact and fiction."

EVERY WEDNESDAY

World's News

2D.

ARTIFICIAL LARYNX — WONDER OF SCIENC

NEW MARVEL BRINGS SPEECH TO THE DUMB

(By Our Special Correspondent)

"And the dumb spoke . . ." These wonderful words of the Bible came to my mind when I recently visited the private theatre of a world-famous scientific laboratory in London and was introduced to the latest wonder, which restores the faculty of speech to the dumb.

FOR the first time in my life I appreciated my good fortune in possessing a larynx by means of which I could speak and express my thoughts.

A strange fact drew my attention to this highly interesting new device of world-wide importance.

Some time ago Mr. Sam Higgins, jun., a well-known Manchester merchant, lost his voice as the result of an operation, and after three months, by a new miracle of modern science, he commenced to speak again. He himself told the story.

Approximately a year ago, while driving in his car, he witnessed a double shooting tragedy. This gave him such a shock that his blood turned cold. About 20 days later he lost his voice, and for months could only whisper. Then he gradually became dumb. Specialists tried everything, but he contracted a septic throat. Later on all his teeth were extracted, and finally the doctors suggested an operation, which was carried out.

Eight weeks after this operation he underwent a second one in a London nursing home, setting all his affairs in order before doing so as a precautionary measure. Ten famous surgeons of England stood at Mr. Higgins's bedside and tried all in their power to help him.

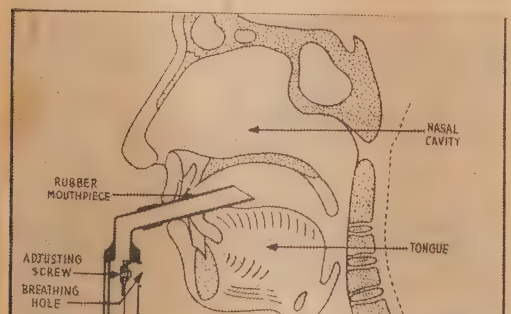
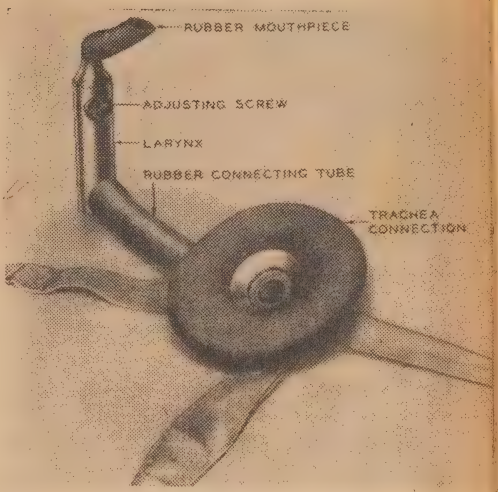


Diagram indicating method of application and operation of the artificial larynx.



An artificial larynx for those born dumb and whose vocal chords have been rendered inoperative. In such cases, afflicted persons have to press bellows in order to generate air currents for the production of speech.

The second operation was successful, but the patie lost his voice entirely. He knew that he would never spea again. One day, as though a miracle had happened, specialist came to him, together with another man wh kept something resembling a pipe in his mouth. He e plained that it was a pipe of peace, and afterwards h showed it to Mr. Higgins, saying that a very short tim ago he also had been unable to speak, but that scienc had helped him.

DETAILS OF APPARATUS

Next morning Mr. Higgins left for London, and in thre months' time he phoned his mother in Bramhall, where sh lived. At first the old lady could scarcely believe that he dumb son could speak. Later on, when she recognise Sam's voice, she began to cry.

Mr. Sam Higgins, jun., then returned to the Manchester fruit market in Smithfield, and since then he has carrie on his business as he did previously. He is happy again The "pipe of peace," or rather, "the artificial larynx, restored him to the world of speech amid the rejoicing o his family and friends.

That is the end of Mr. Higgins's curious story which induced me to get in touch with the scientific experts wh had introduced this great new wonder to mankind. So entered the private theatre of a world-famous scientifi laboratory in London, where a curious talkie film wa projected on to the screen for my benefit. The film started with a scene where an attractive little boy stood before a microphone and sang the famous rose aria from "Carmen" in an exceptionally fine tenor voice. Then a scientist explained to him how his wonderful voice was created. The film afterwards described the whole process of human speech and later on the scientist spoke about some people who had lost the faculty of speech. The little boy shuddered. "How terrible!" he said, and clutched at his own throat. The expert smiled and said:

"But we can assist dumb people. We can give them new voices. We are able to supply them with an apparatus

Continued on Page 75.

CIENCE KEEPS IT COLD WITH DRY ICE

The absorption towers, 70ft. in height, are a striking feature of the Mount Frome Plant, where Dry Ice is made in Sydney.

IT ISN'T ICE AND IT ISN'T DRY!

Have you ever seen the ice-cream man with his steaming tray of buckets which manage to keep so cold? There is magic here—modern, scientific magic! It is the magic of Dry Ice, which is not ice, and which isn't dry! This article tells you just how science has overcome the problem of keeping things very cold, easily and cheaply. Our pictures by courtesy of Mount Frome Lime Ltd.

HE dictionary that I possess defines the word "dry" as follows: "Lacking in, free from, moisture; opposed to wet; also (of a well) not yielding water; (of a cow) not yielding milk." here are also several colloquial meanings to the word, such as a "dry argument," a "dry party," a "dry lecture," dry hotel," to which you can apply ir imagination according to whether you are temperate or otherwise.

he definitions that concern us, however, are those mentioned first. For substance known as dry ice is "lacking in, free from, moisture"—also like dry well, it does not yield water, or e a dry cow, it does not yield milk, hough it has the appearance of zen milk.

ISN'T ICE!

Dry ice has nothing whatever to do th ice. As a matter of fact, if you put piece of dry ice and a piece of water together, funny things begin to ppen!

Most of you have probably seen dry , although you may not have recognised it as such. Have you been wn on the beach on a hot day and en the ice cream man walking round th a box emitting large quantities of team"?

This "steam" has nothing to do with aking the ice cream warm enough to t. On the contrary, it has the effect making the ice cream hard enough to break with a hammer. It is really carbon dioxide gas, given off the dry ice with which the ice cream is packed.

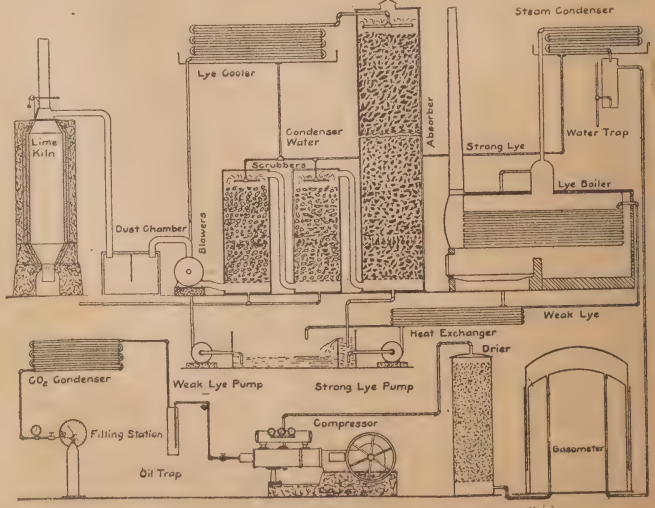
Dry ice is solid carbon dioxide. If you want to find out how cold it is, just sit on a piece. You have no need to be afraid of getting your trousers wet. All you do is stick to it, and you will probably have to sit in a bucket of boiling water to melt it away.

The temperature of dry ice is minus 117 degrees Fahrenheit!

Perhaps after this preamble we had better begin at the beginning.

SOLID CARBON DIOXIDE

As I said before, dry ice is solid carbon dioxide. According to a chemistry text book, carbon dioxide is a "colorless gas, possessing a slightly pungent smell and acid taste. It is very heavy and can readily be poured from one vessel to another. Its chemical formula



Schematic arrangement of plant for making carbon dioxide from kiln gas.

is CO_2, which means that it is composed of one part of carbon and two parts of oxygen."

"It is non-combustable, and the presence of 4 per cent. of carbon dioxide in air is sufficient to extinguish a burning candle. It is not poisonous, but it will not support respiration, so that air containing much of it asphyxiates."

Carbon dioxide is a prolific gas in nature. It is found emanating from the earth in many places, and gives rise to the sparkling spas found on the Continent of Europe. It is given off in the exhaled breath of living things. There is plenty of it about in the "hot air" of election times, and the speech times of fulminating dictators. This may explain why listeners get sleepy listening to their speeches.

USED FOR SODA WATER

The gas is used in the manufacture of aerated waters. The bubbling in lemonade is nothing more or less than carbon dioxide. There is no soda in "soda water." This liquid is merely ordinary water impregnated with carbon dioxide.

Large quantities of carbon dioxide are given off in the manufacture of that universal beverage known as beer. It is formed by the sugar undergoing alcoholic fermentation. A large quantity of the gas is retained in the beer, which gives the necessary "bite." Or at least it should.

Carbon dioxide is also given off in the combustion of coke in furnaces.

When liquid carbon dioxide is allowed suddenly to evaporate, part of it solidifies owing to the decrease in temperature produced by the evaporation.

If you are in a position to gain access to one of those steel cylinders of liquid CO_2 used in some soda fountains, you can try an experiment. Tie a coarse canvas bag or a handkerchief around the outlet valve of the cylinder and open the valve. The liquid rapidly flows into the bag, part vaporises and escapes through the pores of the bag, while the remainder solidifies owing to the decrease in temperature, and collects in the bag in the form of a white bulky crystalline powder resembling snow.

COMPACT UNDER COMPRESSION

On compression in a wooden mould a compact mass is obtained, which does not readily evaporate in air.

The most widely-used method for the manufacture of liquid carbon dioxide (and consequently dry ice) is that which makes use of the combustion of coke.

Furnace gases resulting from the combustion of coke, contain about 20 per cent. by volume of carbon dioxide. As steam is necessary in the manufacturing process, the boiler is fired with coke and the furnace gas drawn off by means of fans.

This furnace gas is, of course, by no means pure. It is a mixture of carbon monoxide, sulphur dioxide and carbon dioxide, &c.

It is, therefore, necessary to remove the impurities, and for this purpose a scrubbing system is used. This consists of two towers in series. One tower is packed with hard coke, with water dripping through the coke.

The furnace gases are forced through this to the top of the tower. Here they enter the second tower, in which is a dilute solution of sodium carbonate.

The next process is most important, and is the absorption of the gas into solution. This is accomplished in a series of towers packed with coke, over which a solution of potassium carbonate is pumped while the flue gas passes from the bottom upwards.

Potassium carbonate has the property of absorbing carbon dioxide whilst rejecting other gases. This reaction transforms the potassium carbonate into potassium bicarbonate.

It now remains to liberate the carbon dioxide from the potassium carbonate solution. This is accomplished by boiling the lye solution in a specially designed container and feeding the resulting mixture of steam and carbon dioxide into a coiled tube condenser, where the steam is condensed into water and passed back into the lye solution.

We now have our carbon dioxide impregnated with water gas. This water gas has to be removed. The first essential is to cool the gas in a simple cooler to the temperature of the water supply, after which it is passed through calcium chloride, which absorbs all the remaining water. The pure dried gas is now ready for liquefaction.

Liquefaction of the gas depends on the pressure and temperature applied. Carbon dioxide can be liquefied at ordinary factory temperatures by applying pressure at about 700lb. to the square inch.

Cutting a block of Dry Ice on the electric saw.

By
CALVIN
WALTERS

MULTI-STAGE COMPRESSOR

Since the temperature rises when t gas is subjected to pressure, most mode compressors are of the multistage ty in which the gas is submitted succe sively to form two to four different a increasing pressures, being cooled means of cold water between each stag

Lubrication of the cylinders of t compressor is a problem. Ordina lubricating oils taint the gas with undesirable odor, which lowers the gra of the product. For this reason o of a highly refined nature are used, a these are odorless, tasteless and colo less.

The compressed gas is now fed in a condenser, which is merely a coil piping submerged in water. Here liqu faction actually takes place.

Steel storage tanks are used to sto the bulk liquid gas, and from this t smaller steel cylinders, which are fam liar to all, are filled for distribution.

AND NOW—DRY ICE!

We come now to our dry ice. I trus that readers have not lost patience, a the foregoing is the most importa process involved in the manufacture o dry ice, and must be described in detai

The dry ice part of all this busine is really very simple.

Essentially it consists of releasing th compressed gas into a tank or box. Thi sudden expansion produces an intens cold, due to the enormous volitility o the substance and the gas freezes int a pure white crystalline "snow."

This "snow" is removed from the tan when full and placed into moulds, where pressure at the rate of approximatel 800lb to the square inch on the hori zontal block faces, is applied. This gives us our "dry ice."

Continued on Page 77.

T HAPPENED THIS MONTH

Radio and Science in the News

ret Radio to Britain

SECRET transmitter, broadcasting anti-British propaganda, concluding essions with the National Anthem, been reported active during the last or two. It is very doubtful whether radio is operating in Britain, as is ned. It is more likely that it dcasts from the Continent.

* * *

gnetic Poles Wander

DMIRAL BYRD, at present explor-ing in the Antarctic, reports that the th Magnetic Pole has changed its tion since it was located in 1909. movement of the magnetic poles is icient to upset the calculations of igators who rely on the compass their main bearings.

* * *

own Sinks Three Feet

COLLAPSE of old mine workings at Shenandoah (U.S.A.) caused sixteen ks in the centre of the city to sink e feet. Damage is estimated at 5,000. Nobody was injured, although 9 people were forced to fly from their nes.

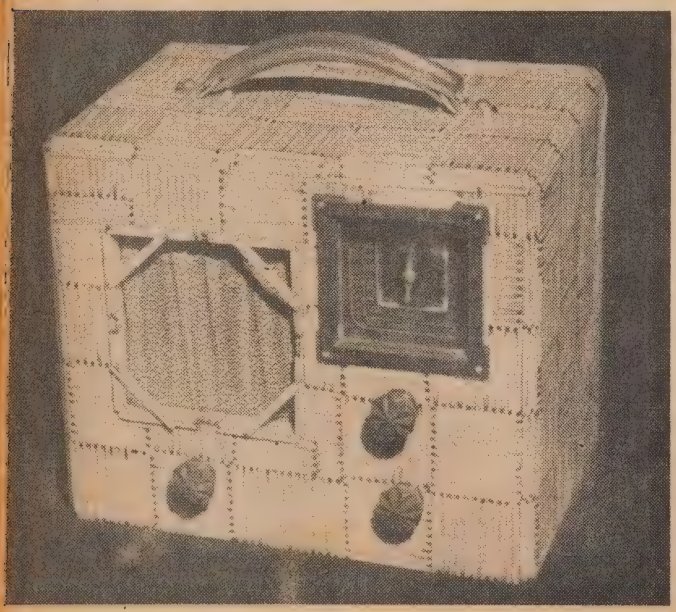
Birds Cause Blackouts

SHORT circuits of power lines caused by birds rubbing beaks while perched on high tension wires are responsible for blackouts in the Boree Shire, according to the Shire Clerk. It has been found necessary to use special screens to prevent the birds completing an electric circuit during their demonstrations of affection. Recently a magpie completed an 11,000-volt circuit at Auckland. It was burnt to a cinder, and many people were without light or power for some hours.

* * *

Sunspots and War

A NEW effect of sunspots, this time on human beings, has been claimed by Abbe Theodore Moreux, a French astronomer. He asserts that an increase in solar activity results in a corresponding "strange fever" to possess the brains of men. This has been the cause of major wars, and, conversely, major achievements in more peaceable matters. He forecasts that, as the present activity subsides, the solar system will bring peace to the world during the year.



Here is a 4/39 receiver which one reader has housed in a cabinet made of thousands of match sticks. Sprayed with clear lacquer, it has a most unusual finish.

Dust Causes Short Circuit

LAST month we mentioned that accumulations of dust, when dampened by rain, caused short circuits which set alight a number of telegraph poles in Sydney. Recently a line carrying 30,000 volts fell across a street in Haberfield, narrowly missing a number of pedestrians. The break is believed to be due to a short circuit also caused by dust, which set fire to the pole.

* * *

Dutch Trace Spy Radio

A SECRET transmitter relaying reports to Germany from Holland has been located near Rotterdam. As a result, two men, including the chief of the German Press Service, were given sentences of five years. One of the men admitted receiving about £43 per month from Berlin for his work. Signals were so strong that they had been heard in the United States.

* * *

Wind Generator at Sea

THE master of the Finnish barque, Penang, a seagoing sailing ship, is using a wind-driven generator to supply current for lighting and radio. The principle is the same as that used for radio and lighting plants in the country. The master considers it to be the only installation of its kind in the world.

* * *

Boy Takes 6600 Volts

A NARROW escape from death was the experience of a Newcastle boy who recently came into contact with a 6600-volt electric cable. He climbed on an electric sub-station and contacted the wire. He suffered only severe burns. Such an experience would, as a rule, cause instant electrocution. Subsequently the boy died in hospital as a result of the burns.

* * *

Human Seismograph

A RESIDENT of Perth claims that he is able to record earthquakes and similar disturbances without instruments. He becomes violently ill when such a disturbance takes place, even though the scene of activity is on the other side of the world. During the recent Turkish disaster he is reported to have been ill for four days.

* * *

Car Radio Telephones

SOON we may have our cars equipped with radio telephones, which will enable us to connect with and talk to our friends while driving along the road, says L. A. Hooke, general manager of A.W.A. He refers to present communication systems in use by Sydney enterprises as merely indicating what eventually may become commonplace. An article on the system used by the Electricity Commission will be found in this issue.

THE PROGRESS OF MR. HUMPERDINK

Un ami du doyen Swift lui envoya un jour un turbot par un jeune do—
mestique qui n'avait jamais reçu de la part
du doyen la moindre marque de générosité.
Entré dans la maison, le jeune homme ouvrit la
porte du cabinet du doyen, et, désposant
brusquement le poisson, dit à voix haute: "Mon
mâitre vous envoie un turbot."
wef
Sez you!

Gas versus Petrol

BRITAIN'S exploitation of fuel sources other than petrol is proceeding apace. Methane, which may be derived from sewage, coalmines and coke ovens, is favored, as it is equivalent to petrol at 10d per gallon, reports a London paper. Its efficiency is higher than petrol or coal-gas. Conversion to methane equipment is estimated to cost £25. Scotland has natural methane sources equivalent to at least 45,000,000 gallons of petrol. Gas companies are also developing coal-gas fuel; the conversion of the vehicle costing from £30 to £50. One firm is turning out producer gas plants at the rate of 50 per week.

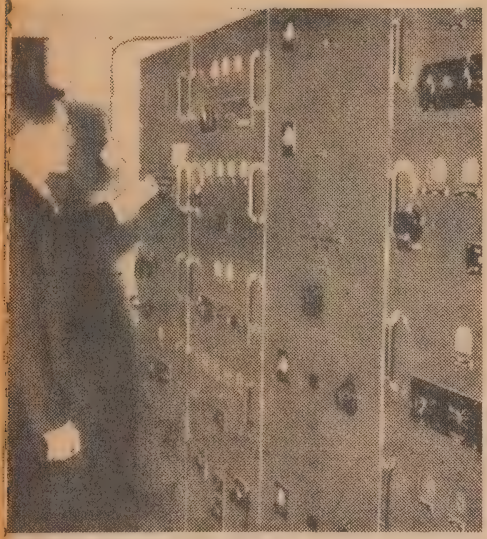
Mammoth Star Discovered

STATED to be 42,000,000 miles in diameter, a new star has been discovered by two American astronomers. It would be large enough to swallow both the earth and the sun at the same time. It is probably one of the most interesting stars yet discovered, and during an eclipse, enables the scientists to gather more new facts about stars and their composition. It is 40 light years away, which means that, travelling at 186,000 miles per second, light takes 40 years to reach us from this star. However, even this colossal distance is small compared with the distance between the earth and the furthest stars.

Bomb Records Destroyed

SO dangerous is a new bomb perfected in the U.S.A., that the records detailing its nature and preparation have been destroyed. It is known that the bomb is a combination of oxygen, silica sand, and carbon, which are capable of creating an unprecedented explosion. It is believed that a bomb of this type is actually Hitler's secret weapon, although the German version is at the moment impracticable. It is believed too dangerous to handle in a plane. Although experiments had been carried out in the Spanish war, so far the Germans have not been able to do anything with it.

☆ ★ ☆ *The* TECHNICAL



An engineer tunes up the frequency modulated transmitter at W1XOJ.

UHF (ultra-high frequency), where de Mars was alone with Major Armstrong in realising the possibilities of F-M as applied to broadcasting in the UHF; together they urged the Commission not to promulgate an allocation scheme which did not include ample opportunity to demonstrate the system.

Mr. Shepard heard the Major's system first in the fall of 1936 over C. R. Runyon's 250 watt transmitter on 110,000kc. (now W2XAG, 5000 watts), in Yonkers, N.Y., and was impressed to the extent that he then authorised the project to be built on Asnebumskit Hill, in the town of Paxton, near Worcester, Mass.

Those closely associated with UHF often find themselves discussing: What will the DX limit of an F-M transmitter be?

While it would be sheer folly to attempt to answer that question at this time, certain obvious facts should be brought to attention.

First, the DX limit of an F-M transmitter (this is provided one uses an F-M receiver, of course) will be considerably greater than heretofore possible with amplitude broadcasting. Why? Since there will be no outside interference, such as QRN, heterodynes and cross-talk, &c., a very few microvolts of signal will be needed to actuate the distant receiver. Also, the stations themselves, for the most part, shall be located in very favorable positions that will afford programmes of entertainment value **far beyond the horizon.**

FREQUENCY MODULATED STATIONS MULTIPLY IN U.S.A.

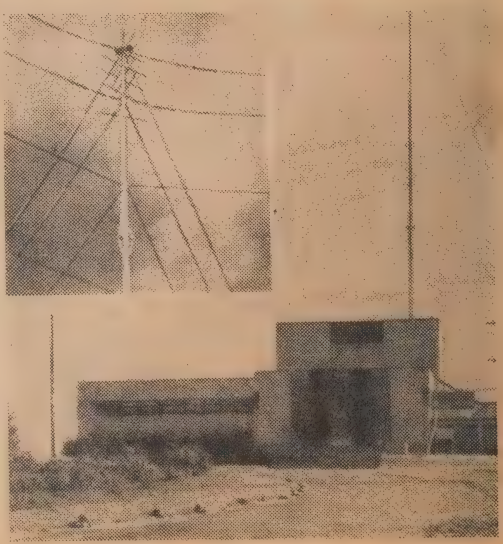
Frequency modulation continues to forge ahead in U.S.A. Here is an interesting article describing an "ear-witness" experience of one of the first frequency modulated transmitters. Possible range of transmission is also discussed.

"THEY can reproduce silence," said Henry M. Lane, Engineer and Radio Editor of the Boston "Post," when he first tuned in W1XOJ, the new **frequency modulated** transmitter of the Yankee Network. Well may that be said, for by our own observations no e can help but be impressed by the absolute quiet of e background, the trueness of high fidelity and the turalness of any sound, whether it be a glass of water ing poured, a match being struck, or yesterday's newsper torn in half.

W1XOJ, the first step in providing broadcast service to w England using the system of frequency modulation veloped by Major Armstrong, is now in daily operation om 8.0 a.m. to 12 midnight, E.S.T.

This station is the outcome of a meeting with Major rmstrong by Paul A. de Mars, the Yankee Network's chnical Adviser. Mr. de Mars was immediately convinced at Major Armstrong had an invention that would some y revolutionise the broadcasting art, so he proposed to hn Shepard, 3rd, president of the Yankee Network, that ey begin experiments with the Major's system, as their evious experience with the conventional methods of broadsting in the ultra-high frequency bands had shown them at little or no improvement could be made at this time.

Before action and plans along these lines could be carried t, the Federal Communications Commission called a neral hearing in connection with the allocation of the



The aerial and transmitting station at W1XOJ.

EDITOR'S WORLD REVIEW

Developments in other lands

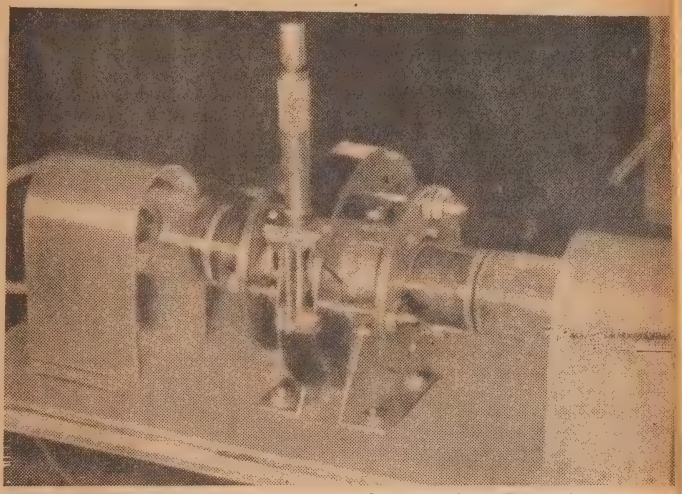
At the writer's location (Plasantville, N.J.), we have been able to make a study of receiving F-M stations. W2XMN, which is 114 miles from us, is received with no difficulty whatsoever, any time of the day or night. W1XPW, which was first heard on a super-regenerator (amplitude modulated type of receiver) at a distance of 178 miles, has since been picked up when there was the slightest tendency toward bending of the UHF waves in the lower atmosphere, and when this lower atmosphere bending was prevalent it has been possible to log W1XOJ (near Boston) 251 miles away—this when the power was but 2000 watts!

—"Radio and Television."

* * *

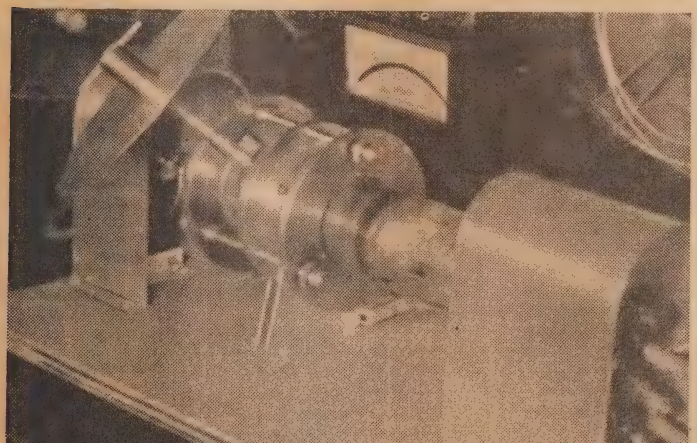
TEN-CHANNEL radio equipment for transmission and reception has been devised by the Western Electric Company. The transmitter, which has an output of 125 watts, functions as a telephone, telegraph or facsimile unit and may be operated from a remote spot by an electrically activated control panel.

The receiver, which will pick up any of the previously mentioned services, is also adapted to remote operations. The motor-generator units which supply the power to this equipment have an ingenious plug-in arrangement to operate on either 24 or 12 volts without circuit change.



These two pictures, taken from Electronics, are of some entirely new equipment specially developed for generating micro-waves. Intensive research is going on all over the world to develop this little-known section of the radio spectrum.

Receiver tube. Tuning (the range is about 9 to 11 cm) is accomplished by compressing the thin walls of the resonating chambers with the micrometer adjuster until the greatest sensitivity is obtained.



Transmitting tube. The antenna (projecting wires above disc) is a half-wave dipole coupled to the "catcher" rhumbatron (resonating chamber where the electron groups deliver their energy).

SCREEN TELEVISION

NEW PROJECTION METHOD

GIANT television images may be projected on screens if a new tube invented by two Englishmen and assigned to RCA is put into production. Accordingly, the New York "Times" reported the new receiving system would eliminate the use of fluorescent screen. Instead, there is used a glass prism with a surface that totally reflects light. On the polished surface are tiny particles of carbon or mica, adhered by electrostatic electricity.

The prism face is the "screen" in the television receiving tube. When it is scanned by the electron beam which "paints" the image, the tiny crystals are caused to fly away from the prism surface in proportion to the light and shadows of the image being broadcast.

A beam of light thrown against another face of the prism now is not totally reflected, but some of the light passed through the reflecting face in accordance with the movement of the crystals.

The light, now projected on the screen, has proper highlights and shadows.

A.V.C. IN THEORY AND PRACTICE

PART TWO—(Continued From Last Month)

Amplified A.V.C.—Audio A.V.C.—Modulation rise—A.V.C. with battery valves and zero bias—Special case with simple A.V.C.—Time constants —A.V.C. Characteristic Curves.

By
F. LANGFORD SMITH
B.Sc., B.E.

HERE are a number of methods whereby the voltage to be applied to the grids of the controlled stages is amplified, either before or after ification.

(1) One or more stages of amplifica- may be used to form an A.V.C. plifier channel operating parallel to signal channel, and having a sep- te diode rectifier. If the total gain the A.V.C. amplifier channel is ater than the total gain of the ivalent section of the signal channel, re is effectively a system of ampli- A.V.C. This is more effective than usual arrangement with a single annel, since it retains the full am- fication of the A.V.C. channel under conditions. It also has advantages flexibility due to the isolation of the o channels, and the A.V.C. channel ay be designed to have any desired tectivity characteristics.

(2) If a common I.F. channel is used, is possible to add a further I.F. stage th fixed bias for A.V.C. only, followed a separate A.V.C. rectifier. By this eans it is possible to avoid the distor- n due to shunting of the diode load sistor, or to "differential loading" at e point where the A.V.C. delay is just ing overcome.

(3) A D.C. amplifier may be used to nplify the voltages developed at the ctifier. This method has the disad- ntage that it is difficult to obtain satisfactory and consistent performance from a D.C. amplifier.

AUDIO A.V.C.

Audio A.V.C. is used in conjunction with A.V.C. on the R.F. and I.F. stages, and is a device to flatten out the A.V.C. characteristic by applying the whole or part of the A.V.C. voltage to an audio frequency amplifier having a super-control characteristic. Conventional systems of this nature tend to introduce considerable audio frequency distortion if operated at a high level so that the arrangement is not widely used. In the design of a receiver to use audio A.V.C. it is desirable first to obtain the best possible characteristics apart from the audio amplifier and then to add just enough A.V.C. voltage to the audio system to make the A.V.C. characteristic sufficiently flat. For a typical Audio A.V.C. characteristic see Fig. 8, or the improved form in Fig. 9.

MODULATION RISE

When a modulated carrier is amplified by a valve having a curved characteristic the modulation percentage will increase. This modulation rise is noticed in the output as audio frequency harmonic distortion, mainly second harmonic. Practically all modulation rise occurs in the final I.F. stage. 20 per cent. modulation rise is equivalent approximately to 5 per cent. second harmonic. Modulation rise with fixed bias is extremely small even with super control valves, but there is a slight advantage in operating with an equivalent valve having a sharp cut-off characteristic. Modulation rise may be decreased by operating the I.F. stage on a fraction of the A.V.C. voltage, but this adds to the expense of the receiver. Alternatively, a noticeable improvement may be made by supplying the screen from a dropping resistor from B plus. This is recommended for circuits having an R.F. and one I.F. stage. Modulation rise may be reduced by increasing the gain from the grid of the final I.F. valve to the A.V.C. diode, that is by producing a higher A.V.C. voltage for the same plate voltage excursion in the I.F. amplifier. The use of the delayed A.V.C. circuits of Fig. 2 and 7 will assist in this direction. Modulation rise may also be reduced by improving the control on earlier stages, for example by reducing the screen voltage on the R.F. or converter valve so that an earlier cut-off is provided. This is likely, however, to result in cross modulation when the receiver is used in proximity to a strong station. See also the later section on A.V.C. characteristics and Fig. 8.

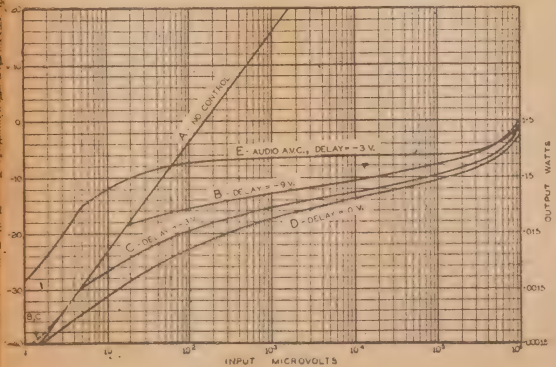


Figure 8

A.V.C. WITH BATTERY VALVES AND ZERO BIAS

When 2 volt battery valves operating at zero bias are used it is possible to obtain delayed A.V.C. by incorporating a duo-diode-triode or duo-diode-pentode valve having a diode plate situated at each end of the filament. A delay of between 1 and 2 volts is obtainable by this means and makes a very simple and satisfactory arrangement. The diode at the positive end of the filament is used for A.V.C. and its return is taken to filament negative. The diode at the negative end of the filament is used for detection and its return taken to filament positive.

SPECIAL CASE WITH SIMPLE A.V.C.

When simple A.V.C. is used with a duo-diode-triode or duo-diode-pentode valve operating with self-bias, the diode load return will be two or three volts above earth, and it is necessary to provide additional negative voltage for minimum bias on the controlled stages.

TIME CONSTANTS

Suitable values of time constants are as follows:—

Broadcast good fidelity receivers, 0.25 to 0.5 second.

Broadcast receivers, 0.1 to 0.3 second.

Dual or triple wave receivers, 0.1 to 0.2 second.

Too rapid a time constant reduces the audio frequency bass response since rapid periodic fading is equivalent to bass frequency modulation. It is for this reason that a slow A.V.C. system

is required for good fidelity broadcast receivers. A more rapid time constant is required for short-wave operation on account of the fading characteristics for these frequencies.

A.V.C. CHARACTERISTICS

A.V.C. Characteristic Curves may be plotted on 6-cycle log-linear graph paper as shown in Fig. 8. The input is usually taken from 1 mV. to 10.6 mV. or 1 volt. The output is usually shown in decibels, with an arbitrary zero. With care in the experimental work, A.V.C. curves are extremely valuable to the receiver designer, not only to demonstrate the effectiveness of the A.V.C., but also to indicate modulation-rise, and the input voltage at which the A.V.C. commences to operate.

For design purposes it is also helpful to draw on the same graph.

(a) A curve of distortion against input voltage for 30 per cent. modulation at 400c.
(b) A curve of the developed A.V.C. voltage against input voltage, and
(c) Curves of the total bias voltages of the controlled stages against input voltage.

If fixed minimum bias is used, curves (b) and (c) will differ merely by the bias voltage. If self-bias is used they will differ by the minimum bias voltage with no input voltage, and will tend to run together at high input voltages.

Fig. 8 shows several A.V.C. curves, each corresponding to a particular condition. In taking these curves two separate diodes were used so as to maintain constant transformer loading and other conditions. Contact potential in the diode results in a slight increase in the standing bias of the controlled valves, but does not affect the delay voltage.

Curve A is the "No Control" characteristic and is the curve which would be followed with A.V.C. removed from the receiver, up to the point at which overloading commences. This curve is a straight line with a slope of 20 db. per 10 times voltage.

Curve B is the A.V.C. Characteristic for a delay of —9 volts. From 3 to 18 mV. the experimental curve follows the "no control" line exactly, and then deviates sharply at inputs above 18 mV. From 18 to 500,000 mV. the curve follows an approximately straight course with an average slope of 4.25 db. per 10 times voltage. Above 500,000 mV. the curve tends sharply upward, indicating severe modulation rise.

Curve C is the A.V.C. Characteristic for a delay of —3 volts. The A.V.C comes into operation at a lower input voltage, and the average slope is steeper than for the higher delay voltage. In both cases, however, the "knee" of the curve as it leaves the no control line is very sharp and clearly defined.

Curve D is the A.V.C. Characteristic for a delay of zero voltage, with due compensation for the effect of contact potential on the standing bias of the controlled valves.

Curve E is the Characteristic obtained with a typical Audio A.V.C. System. Over the range from 100 to 500,000 mV. the total rise is only 3 db.

Curve B has been drawn according to the conventional method whereby the output is adjusted to half the maximum output of the receiver at an input of 1 volt. Curves C and D were taken directly, without any further adjustment to the volume control. Owing to a slight effect on the gain of the receiver when the delay voltage is varied, Curves C and D fall slightly below the datum line at an input of 1 volt. Curve E has been drawn to correspond with Curve C, since both have the same delay voltage. The volume control, however, was advanced considerably for Curve E. It should be noted that no conclusions should be drawn from the relative vertical positions of A.V.C. Characteristics drawn according to the conventional method since the volume control settings are unknown.

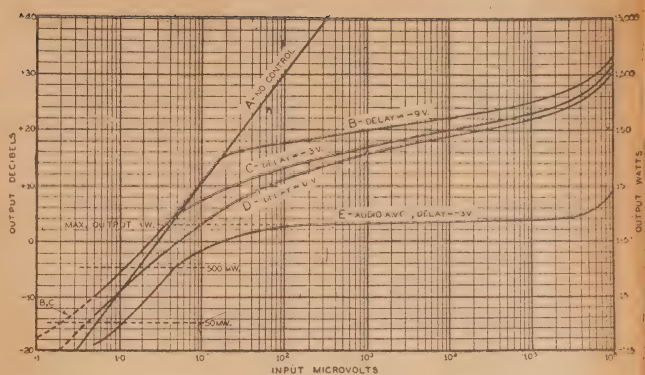


Figure 9

AN IMPROVED FORM OF A.V.C. CHARACTERISTIC

The conventional A.V.C. Characteristics do not give all the desired information concerning the operation of A.V.C. and an improved form, due to M. G. Scroggie, is as follows:—

Instead of commencing at an input of 1 volt and adjusting the volume control to give one-quarter or one-half of the maximum power output at 30 per cent. modulation, Scroggie's method is to commence at a low input with the volume control at maximum. The input is increased until the output is approximately one-quarter maximum, and the volume control is then set back to reduce the power output to one-tenth of the reading. This process is repeated until an input of 1 volt (or the maximum limit of the signal generator) is reached.

This method is illustrated in Fig. 9 which applies to the same receiver as was used to obtain Fig. 8. The scale of power output in watts represents the output which would be obtained with the volume control at maximum and 30 per cent. modulation. **provided that no overloading occurred in the audio amplifier.** A number of interesting facts may be obtained from an examination of these curves.

(1) The residual noise level of the receiver may be shown (this applies particularly to receivers of fairly low sensitivity).
(2) The sensitivity of the receiver microvolts input for any sele output level (e.g., 50 to 500 m may be read directly from curves. It should be noted that output includes noise.
(3) The power output correspondin any selected voltage and any p tion of the volume control ma obtained. For example, with delay of —3 volts, the A.V.C. c mences to operate at an ou level of slightly over 3 watts, 30 per cent. modulation and volume control at maximum. a further example take the s curve at an input of 1000 where the output is shown as proximately 75 W. for 30 per c modulation and maximum vol control setting. The setting of volume control to give 3 watt 100 per cent. modulation is th fore—

$$\sqrt{(30/100)^2 \times (3/75)} = \cdot 3\sqrt{\cdot 04} =$$

or approximately 1/16.7 of maximum setting.
(4) The voltage at the detector the A.V.C. bias voltage if exc from the secondary of the transformer) may be calcul from a knowledge of the a gain and detector efficiency.

The Audio A.V.C. Characteristic 9) gives an excellent example of information which may be der from this improved representation the knee of the curve the A.V.C. c acteristic is about 9 db below the c having the same (—3 volts) d This loss is all in the audio ampl and is the result of using a valve l ing lower gain. The difference bet the two curves increases to 22 db a input of 500,000 mV., thus indica an audio control of 22 - 9 or 13 d this point. With this particular rangement the output with 30 per modulation is 3 watts plus or m 2 db from 30 to 500,000 mV.

This method enables greater ac acy to be obtained at very low i signals since the output power is high on the scale of a typical ou meter. With the conventional me the output under similar input co tions is too small to measure accur ly with a standard output meter.

In LEMENTARY RADIO COURSE

for beginners

ng a very elementary course of Radio study for those who wish to know "what makes the wheels go round."

L. B. GRAHAM, Principal of the Australian Radio College, Pty.

BOUT DUAL-WAVE RECEIVERS

F recent years, dual wave receivers have become immensely popular with the listening public, so that any radio course would be incomte without some mention of this s of receiver.

he term "dual wave" refers to an inary broadcast receiver, with some essary refinements, to which has n added a set of coils capable of ing-in stations operating on short velengths, together with the necesy switching arrangement to change n one set of coils to the other.

he short wavelengths, covered by se additional coils, vary considerably. most popular range in older types that between the limits of 19 and metres. The popular ones at pret are the 16 to 50 and 13 to 39 metre ds.

ALL S.W. COILS

uning to these short wavelengths uires coils of very small inductance a tuning condenser of very small acity. To cover the broadcast range condenser has to have a fairly large acity in the vicinity of .0004 mfd., l, as the one condenser must tune r both bands, the short wave coils st be of very small inductance to k with this capacity. The combina- of a large condenser and a small does not give the highest efficiency, but, as the remainder of the receiver gives a large amount of amplification, this lack of efficiency is not serious.

A receiver being built for dual wave

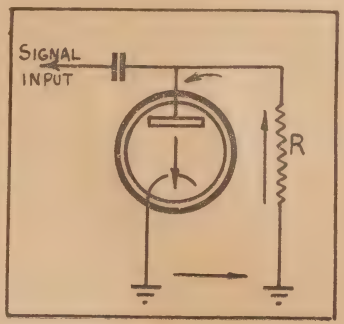


Fig. 3.

operation should be constructed much more carefully than one for broadcast reception only. Particularly does this apply to the earthing systems and the positions of the short wave coils. If these coils are mounted near large metal objects or near other coils, the amount of gain may be decreased considerably, and "dead spots" may occur at some parts of the band. These dead spots are small sections of the band at which the receiver lacks sensitivity.

The earthing system should be wired with heavy copper wire or copper braid. If bolted connections to a ducoed steel chassis are relied upon for earthing, oscillation and weak sensitivity may result, due to the high resistance of the connections.

It is very difficult to keep the performance of the oscillator portion of the set at an even strength over the whole of the short wave band, consequently the most reliable types of first detectors should be used. The Pentagrid and octode tubes together with other special types are admirably suited for dual wave operation.

COMPLICATED SWITCH

The most complicated part of a dual wave receiver is the switching arrangement used to change from one set of coils to the other. In a dual wave receiver, using a radio frequency amplifying stage, there are three broadcast and three short wave coils. Each coil has a primary and secondary winding making six circuits that have to be changed over from broadcast to short wave by means of the switch.

The type of switch used almost universally in modern receivers is as illustrated in Figue 1. This illustration represents one bank of a switch, and is in itself divided into three sections. Each section has a moving arm and three fixed contacts. In a dual wave set one of these fixed contacts may be left blank or may be connected in such a way as to reduce the sensitivity of the set when receiving strong local stations on the broadcast band.

As each bank of the switch has three sections, the six circuits mentioned previously could be changed by two banks. It is usual, however, to use three banks giving a total of nine sections. Of these nine sections, two are left blank, one is used for switching different dial lights, and the remaining six for the coil circuits.

SWITCH CONNECTIONS

The six moving arms of the switches connect to the aerial, the two grids, the plate, and the oscillator grid and plate; the twelve fixed contacts connect in their correct order to the primaries and secondaries of the broadcast and short wave coils. The coils and their small trimming condensers are the only parts

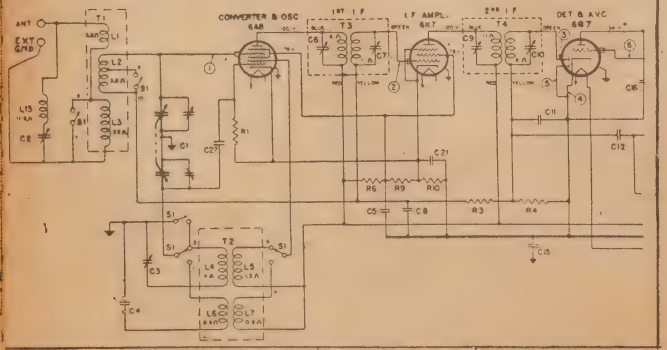


FIG. 2.—A typical circuit showing switch connections.

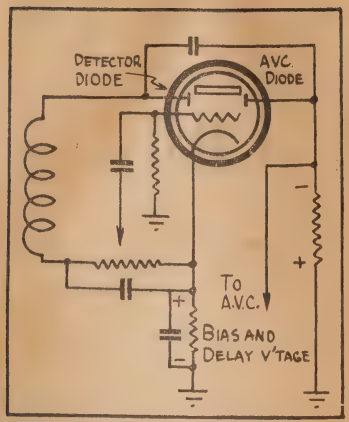


Fig. 5—Typical diode-triode circuit showing delayed A.V.C. connection.

switched in and out, the remainder of the circuit being complete and remaining unaltered regardless of whether the set is tuning to broadcast or short waves.

Triple wave or all wave sets operate on the same principle as the dual wave receiver, the only difference being the addition of extra sets of coils.

Fig. 2 shows the circuit arrangement of the switch and coils.

Signals from short wave stations vary considerably in strength from one second to the next. It would be impossible with a manual control to keep the volume from the speaker anything like steady, so that some system of automatic control to compensate for changing signal strength is almost essential.

Automatic volume control is a method of controlling automatically the amount of modulated carrier wave reaching the second detector tube. It does not operate on the audio frequencies. These are still controlled by a manual volume control to obtain the desired volume of sound.

A.V.C. IN OPERATION

The idea behind automatic volume control (A.V.C.) is to make all stations, weak or strong, produce approximately the same strength of sound with any given setting of the audio volume control. To do this, a station's carrier wave itself must produce the controlling force.

In receivers using variable mu tubes in the radio frequency and intermediate frequency stages, the most satisfactory method of controlling the amplification of these tubes is by varying the bias applied to their grids. In an automatic volume control system, we make the modulated carrier wave produce the negative bias.

The control voltage is usually obtained from the carrier by means of a diode rectifier. This diode may also be the second detector of the set, it may be a separate diode in the same envelope as the detector diode, or it may be a separate tube altogether.

DIODE ACTION

When a carrier wave, modulated or otherwise, is applied between plate and cathode of a diode tube, provided the cathode is heated, current will flow in the diode only when the plate is positive. When the plate is negative, it repells the electrons from the cathode and consequently none will flow. This effect is termed rectification. Instead of current flowing equally both ways in the circuit, the diode only allows it to flow in one direction. The current, although moving only in one direction, is pulsating, that is, it stops and starts at very rapid intervals, depending on the frequency of the carrier wave. If these pulsations are filtered out, a steady direct current will remain.

CURRENT FLOW

The current in the diode circuit will pass in the direction shown by the arrow, through the resistor R of Fig. 3, creating a voltage drop across it, and making the diode and negative in respect to the earthed end of this resistor. The carrier wave has been made to produce a pulsating negative voltage which will vary in strength in accordance with the strength of the carrier wave. The stronger the carrier —the greater will be the negative voltage, the weaker the carrier—the less will be the negative voltage.

If the grid returns of the tubes we wish to control are returned through filter systems to the negative end of R, and the cathodes of the same tubes are returned indirectly through the earth connection to the earthed end of R, the negative voltage which is developed across this resistor is applied as a negative bias to the grids. The circuit is shown in Figure 4.

The bias, which is applied back to the grids of the tubes being controlled,

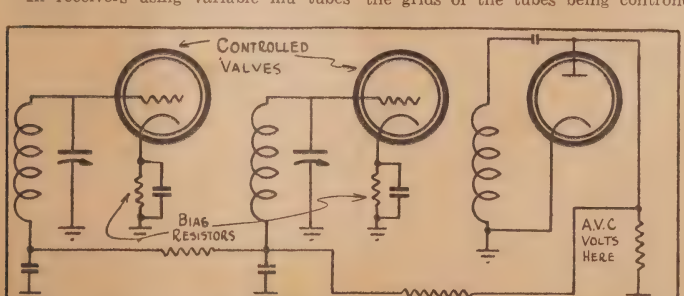


Fig. 4—Decoupling system used in A.V.C. circuit.

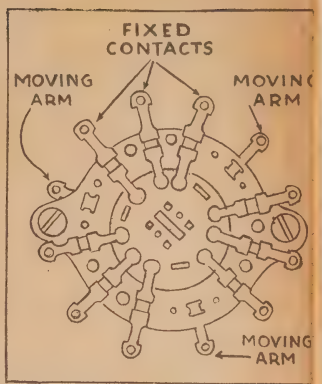


Fig. 1—Outline drawing of a wa change switch-bank.

will vary in proportion to the stre of the carrier waves of various stat A strong carrier will increase the and decrease the amplification w can be obtained from the tubes; a signal lessens the bias and allows tubes to give greater amplification. tendency then is for all signals to r the second detector at the strength.

FAULTS IN SIMPLE SYSTEM

One of the faults with a si A.V.C. system is that regardless of weak the signal is, the A.V.C. will reduce the gain of the receiver small amount as soon as any st is tuned in, consequently the weak nal is made a little weaker.

Delayed A.V.C. is a system des in such a way that it does not op at all on signals until they rea pre-determined strength.

The easiest way to prevent the A from operating on weak signals make the diode plate slightly neg in respect to the cathode. Ther current will only flow when the plate is positive with respect t cathode. there will be no current i diode circuit, and therefore no A voltage, until the signal is s enough to overcome the negative age on the diode plate. As an exa if the cathode is 5V positive wit spect to earth, and the diode pla connected to earth (therefore tive by 5V to the cathode), the s strength must exceed 5V before diode operates.

THE DELAYED SYSTEM

The delayed system as applied a duo diode tube is shown in F 5.

With all forms of A.V.C. it is n sary to prevent the tubes being trolled, from operating with zero when no signal is being received. commonest method of doing this using resistors and bypass conde in the cathode circuit, as shown in 4. These resistors must be of a sufficient to give a voltage drop to the listed minimum bias for the of valve being used.

SERVICE

HE SERVICE-MAN WHO TELLS

By A Service Engineer Of
Radio Equipment Pty., Ltd.

With the growing popularity of "Radio and Hobbies" circuits, my particular section of the service laboratory, has been busy lately finalising and building quite a host of these receivers. And a really good lot they are, too —well worth their salt. However, apart from the "Radio and Hobbies" sets, which in most cases are straight out aligning jobs, I have been able to pick out a few service jobs, which I think will interest you.

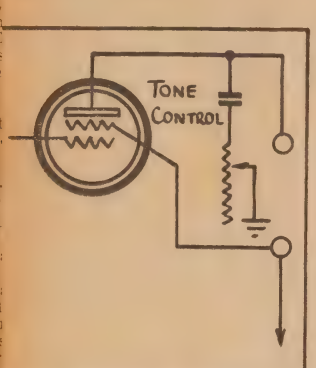
UMBER ONE

. A customer brought a receiver to and complained that the tone con- would not have any effect on the e quality of the receiver, except en it was turned right to the posi- which should emphasise the bass es, where it would stop the receiver rating completely.

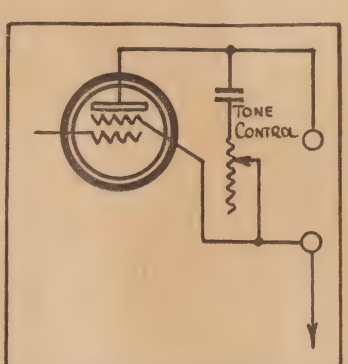
as soon as the control was rotated ay from the bass position, the re- ver would immediately start work- , but further rotation of the control until the arm was rotated to the bass end of the control, in which case the needle jumped to zero resistance, indicating a short circuit.

Apparently, in this set, the tone control condenser had first punctured, due to an excessive voltage and allowed the high B plus voltage of 250, from the plate circuit of the output tube, to reach the end of the potentiometer.

When the arm of the potentiometer was turned toward the bass position, current due to the high voltage was able to flow from the end of the potentiometer, and then the moving arm of the potentiometer is connected to the chassis.



one control connected thus must with- stand high voltages on loud volume.



This connection places only audio voltages across the tone control condenser.

Even without any signal voltages reaching the receiver, there will normally be a voltage of 250 volts between the plates of the tone control condenser, as this is the normal voltage in the plate circuit of the output tube.

Now, when a signal is received, the signal voltages in the plate circuit will add to and subtract from the 250 volts D.C. already there. On loud signals, or on a loud burst of static, the peak signal voltage may become almost as high as 250 volts in an ordinary type of receiver.

HIGH AUDIO VOLTAGE

In fact, a signal of four watts strength, developed across a loud-speaker having an impedance of 7000 ohms. would produce a voltage of 235 volts peak across the loud-speaker. During the period of time during which the plate voltage increases, the 235 volts would be added to the 250 volts already in the circuit, with the result that a total voltage of 485 would be applied across the tone control condenser. Now, many constructors use a 400 volt rating condenser in this position, because they consider this ample to withstand the 250 volts D.C., which is applied to the plate of the tube, but they do not take into consideration the signal voltage which adds to and subtracts from this voltage.

In order to prevent the replacement condenser from suffering a similar fate to the original, I considered it wise to rearrange the connections to the tone control as shown in Figure 2. In this way the moving arm of the potentiometer, instead of being connected to the chassis, is connected to B plus, and the only voltage developed across the condenser is that of the signal voltage alone, which should not exceed about 235 peak volts in an ordinary type of receiver.

With the tone control rewired in this manner, operation was just as effective as in the original, with far less chance of the new condenser breaking down.

i no effect whatsoever on the tone ality.

Knowing the fault to be in the tone ntrol circuit, I immediately con- ted my multimeter to measure the istance of the potentiometer which s as the tone control, and also to ck which the condition of the condenser in tone control circuit.

With the test leads connected to the ndenser, the meter registered zero istance, or a direct short circuit, in- ad of an infinitely high resistance should be found in a good con- ser.

The next thing was to check the entiometer, and with the two leads nected to one end of the potentio- ter and the moving arm, the meter wed an infinitely high resistance tiometer through to the moving arm, and burnt out the carbon strip on the potentiometer.

This was the reason that the ohmmeter showed no reading until the arm was turned right to the end, where it came in contact with a metal stud.

This trouble could have probably been cured by simply replacing the two parts, and doubtless the set would have operated satisfactorily for some time, perhaps for many years.

TONE CONTROL CIRCUITS

The circuit arrangement of the tone control is shown in Figure 1. It will be observed that one end of the condenser connects directly to the plate of the output tube, the other end of the condenser connects to an end of

NUMBER TWO

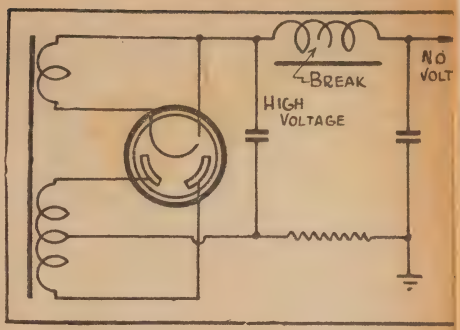
2. When another receiver was switched on, no signals were heard from the loud-speaker, but quite a loud sizzling sound came from one of the electrolytic condensers. This sound was exactly the same as that experienced with most A.C. operated sets when the speaker plug is withdrawn. A glance immediately indicated, however, that the speaker plug was firmly in place.

Electrolytic condensers normally only produce a sizzling noise when the voltage applied to them exceeds the maximum voltage at which they are de-

signed to work. The condensers in this particular set were designed to operate at 500 volts, which indicated immediately that there must be a voltage in excess of this amount reaching them.

As it would be unlikely for the power transformer in the receiver to give an abnormally high voltage, the increase in voltage could only be occasioned by the fact that the receiver was not drawing any current from the rectifier system.

The most probable cause of this would be a fault in the loud-speaker field coil, which would prevent the current from passing from the rectifier to the set, so the first test was, of course, to check the resistance of the loud-speaker field coil.



A break in the speaker field prevented this set from working. High voltage appeared at rectifier and the electrolytic showed the strain by "sizzling." Humidity often causes corrosion of the wire where high voltages are present. A new field was required.

OHM-METER TEST

With the ohmmeter test leads connected to the field coil connections of the loud-speaker, there should normally be a reading which would indicate the field resistance, but in this particular case the ohmmeter gave no indication, pointing to the fact that the loud-speaker field coil had become open circuited.

To cure the trouble, it was necessary to procure a new field coil winding to suit the particular speaker, and to replace the faulty one with this. As soon as this was carried out, the receiver worked quite satisfactorily.

On taking the old winding to pieces, I noticed several spots of green verdigris on the copper wire, indicating that moisture or acid of some form had come in contact with the wire and caused corrosion. The least amount of moisture, in the insulation upon which the field coil is wound, will usually set up an electrolytic action due to the voltage applied to the field coil, and eventually corrode the wire through.

This is a fairly common happening in areas where the temperature and humidity are high, such as in Queensland and other tropical districts.

starts from zero and rises to a peak value which is 1.414 times the effective value. This means that a voltage of 240 A.C. would rise, during each half-cycle, to a value which is equal to 240 multiplied by 1.414 or approximately 340 volts. In a similar manner, the 385 volts developed in each half of the power transformer secondary would rise to 545 volts with no load on the rectifier system. This is the voltage which was causing the electrolytic condensers to sizzle.

NUMBER THREE

No. 3.—The owner of a vibrator operated receiver complained that his set lacked sensitivity in picking up weak signals, and that whenever a distant station was tuned in the reception was marred by a loud buzzing noise. This buzzing noise had gradually become louder and louder over a period of time.

By switching the receiver on and checking the output voltage from the vibrator, this was much lower than it should have been. Actually, the output voltage was only in the vicinity of 90 volts, whereas the particular vibrator power unit should deliver at least 135. In addition, the mechanical noise of the vibrator, which could be softly heard

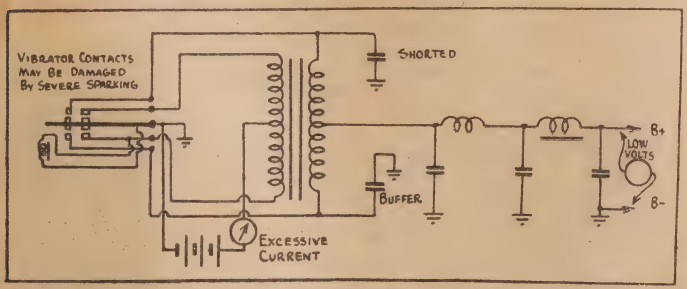
soon as the new vibrator unit plugged into the power unit, the vo rose to 140 volts, and the buzzing which had been heard from the speaker completely disappeared.

In operation, the electrical con of the vibrator unit are caused to and break fairly heavy electrical cu at a tremendous rate.

During every minute of operation come together and separate some in the vicinity of 3000 times, and time they touch and separate a spark occurs between them. It is sparking which gradually corrodes eats away the surface of the con even though they are made of extr hard metal. After a long perio operation, the contacts in the vib eventually become dirty and corr and it is then best to replace the v tor unit with a new one.

TEMPORARY CURE

As a temporary measure, it is times possible to clean up the co surfaces with a piece of very fine paper or glass paper. Even thoug contact surfaces are made quite in this way, it is usually only a porary repair, because it is only a while before they become dirty For this reason, it is hardly w while bothering about cleaning the tacts if a new vibrator unit is ava with which to replace the def one.



A vibrator circuit in which a broken down buffer condenser caused the set to misbehave. A replacement quickly cured the trouble. The vibrator may be permanently damaged by operating the set in this condition.

NUMBER FOUR

No. 4.—The last fault brings to another vibrator operated set whic somewhat similar symptoms to the excepting that it would not bri any broadcasting stations at all. connecting a voltmeter to measur output voltage from the vibrator voltage was very low, being only i vicinity of 30 volts. The mech sound of the vibrator was also very slower than usual and som irregular.

SIMPLE REPAIR

On disconnecting the .01 condenser from the remainde the circuit, and checking i dividually I found that the circuit actually existed inside condenser, and on replacing the denser with a new one the vibrato operated quite well.

It may be wondered how the transformer, which is only designed to supply 385 volts on each side of the centre tap, was capable in giving a voltage in excess of 500 to the first electrolytic condenser. This is brought about by the fact that an alternating voltage from the vibrator itself, seemed irregular. Every now and again the vibrator would appear to miss a beat.

As these are symptoms of dirty contacts in the vibrator unit, the first step in checking up on the receiver was to replace the vibrator with a new one. As

The Set Builders' Success lies in

R.C.S. TROLITUL COIL KITS and COMPONENTS

R.C.S. TROLITUL MIDGET CONDENSERS

M.C. Type.

R.C.S. Midget Condensers are made in two types, using Trolitul supports, thus guaranteeing practically no loss. The 14-plate equals old style 23-plate capacity. The M.C. type may be ganged.

STAR AND M.C. MIDGETS

Max. Cap. mmfd.	Min. Cap. mmfd.	Plates	STAR Cat. No.	Retail Price	M.C. Cat. No.	Retail Price.
10	3	2	CV34	3/6	CV41	6/9
15	3	3	CV35	3/9	CV42	7/3
25	3.5	4	CV36	4/-	CV43	7/10
35	4	5	CV37	4/3	CV44	8/6
50	4	7	CV38	4/9	CV45	9/-
250	5	9	CV39	5/1	CV46	9/6
00	6	14	CV40	5/11	CV47	10/3

R.C.S. POTENTIOMETERS and RHEOSTATS

he R.C.S. Volume Controls are the result of nproved and new methods of manufacture, gether with alterations in design and final sting. Noiseless, they are constructed so as cut off all volume.

			Cat. No.	Retail Price.
6	ohm	Rheostat	25 Amp. PT40	5/-
10	,,	,,	25 Amp. PT38	5/-
20	,,	,,	25 Amp. PT39	5/-
30	,,	,,	25 Amp. PT34	5/-
400	,,	Potentiom.	50 M/A PT46	5/-
1000	,,	,,	35 M/A PT47	5/-
2500	,,	,,	30 M/A PT49	5/-
5000	,,	,,	30 M/A PT51	5/-
9000	,,	,,	20 M/A PT52	5/-
5000	,,	,,	20 M/A PT53	6/6
3000	,,	,,	15 M/A PT54	6/9

FOR THE "LITTLE GENERAL"

R.C.S. Trolitul Coils and I.F.'s—small in size but big in performance—are the reason for this set's outstanding ability to obtain results. Ask for Kit Type K134.

Price £1/10/3. Post Paid.

FOR THE "TINY TWO"

R.C.S. Trolitul Coils with their high "Q" and great sensitivity are essential to obtain the maximum results from the "TINY TWO." Specify Kit Type, K135.

Price 13/-. Post Paid.

Other items for this set are R.F. Choke Type RF86, 1 -; Audio Transformer Type TB4, 20/-; and Star Midget Condenser Type CV40, 5/11.

R.C.S. TROLITUL INTERMEDIATE TRANSFORMERS

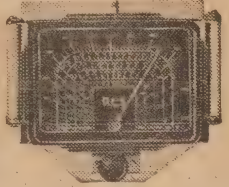
Type IF107

The new R.C.S. Trolitul I.F.s are extremely stable, due to new methods of construction made possible by the use of Trolitul formers and base. No loose wires to shift and alter frequency. Positively the best I.F.s yet produced.

Cat. No.	Retail Price.
Air Core, 465 k.c.	
IF107. 1st I.F. ...	7/6
IF108. 2nd I.F. ...	7/6
Iron Core, 465 k.c.	
IF109.—1st I.F. ...	11/-
IF110. 2nd I.F. ...	11/-
Air Core, 175 k.c.	
IE68. 1st I.F.	7/6
IE69. 2nd I.F.	7/6

NEW R.C.S. DIAL

This dial is the result of considerable experimentation in our laboratories—for perfect tracking with R.C.S. Coils, specify R.C.S. Type DA1, Standard Single-glass D.W. Dial and "F" type Condenser.



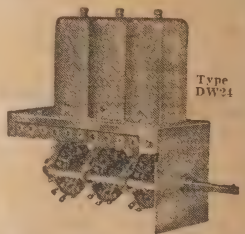
Type DA1 Standard D.W. Dial

PRICE 22/6

R.C.S. DUAL WAVE UNITS

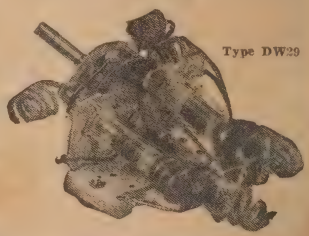
Type DW24, as illustrated, consists of Aerial, R.F. and Oscillator Coils, Wave Change Switch, the necessary B/C and S/W Trimmers and Padder mounted on a rigid steel base, wired up ready to assemble in a set utilising 465k.c. and an R.F. stage. The bands are S/W 16 to 50 metres, and B/C 1500 to 550 k.c.

	Retail Price.
DW24 for A.C. operation	£3 7 6
DW25 for Battery operation	£3 7 6



Type DW24

Type DW29, as illustrated, consists of Aerial and Oscillator Coils, Wave Change Switch, the necessary B/C and S/W Trimmers and Padder mounted together, wired up ready to assemble into a set utilising 465 k.c., the bands being S/W 16 to 50 metres, and B/C 1500 to 550 k.c.



Type DW29

R.C.S. Type DW29 Dual Wave Unit. Retail Price £1 7 6

R.C.S. AUDIO TRANSFORMERS AND CHOKES

Long experience in the production of highly efficient transformers combined with extensive research into raw materials and design, has resulted in the production of an audio transformer of excellent performance and complete reliability.

TB6—"B" Class.

Cat. No.		Retail Price.
TA1	Audio Choke Bakelite Case	18/6
TM1	Modulation Transformer—Power .	30/-
TB4	Single Input "A" Class Bakelite ..	20/-
TB5	Push Pull "A" Class Bakelite Case	21/-
TB6	Input "B" Class Bakelite Case ..	18/6
TB35	"A" Class High Fidelity Steel Case	67/6
TB36	"B" Class Input High Fidelity Steel Case	67/6
TB37	"AB" Class Bakelite	28/6

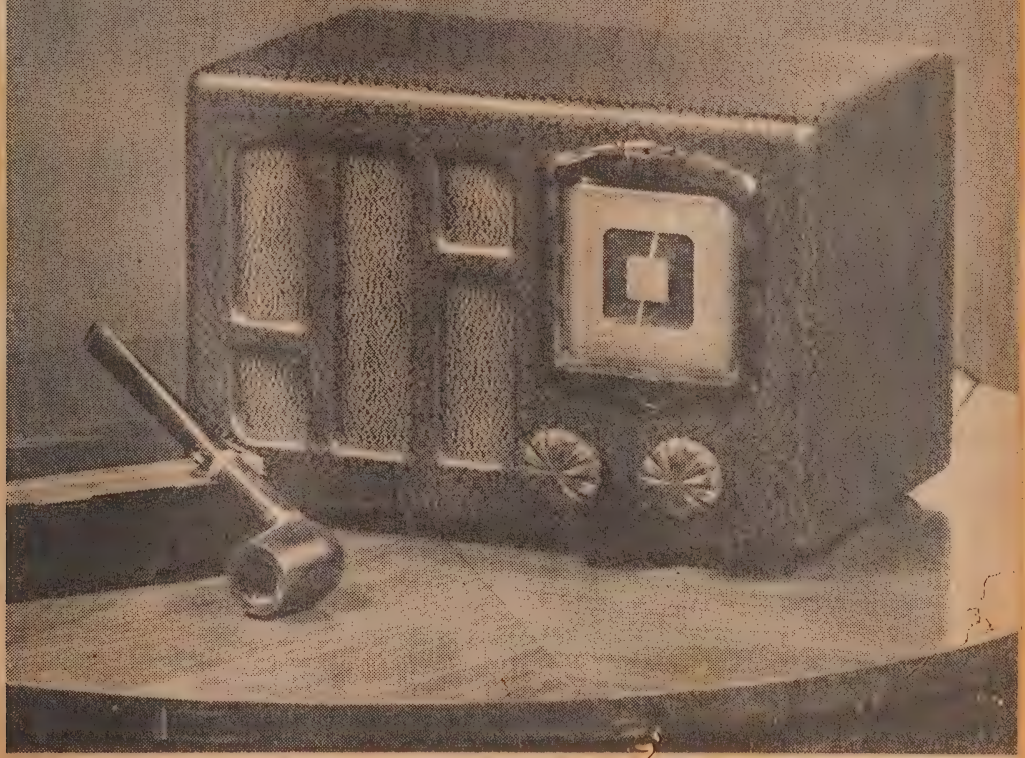
Obtainable from your local dealer or direct from

R.C.S. RADIO PTY. LTD.,

50 Glebe St., Glebe. 'Phone MW2405

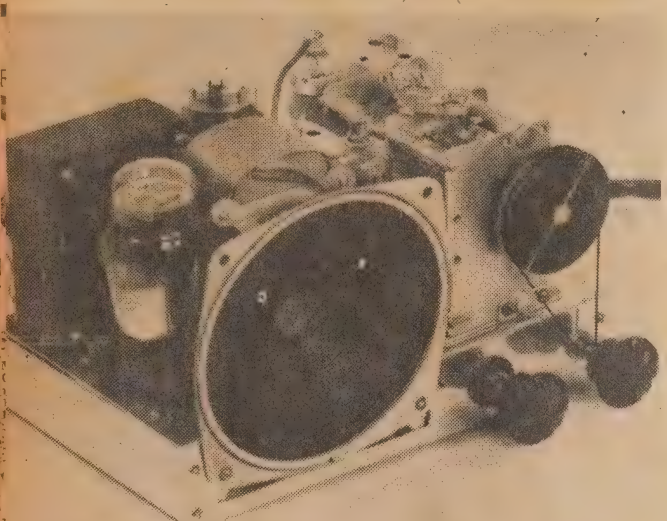
A NEW STAR ARRIVES!

THE "Little General" MANTEL RECEIVER

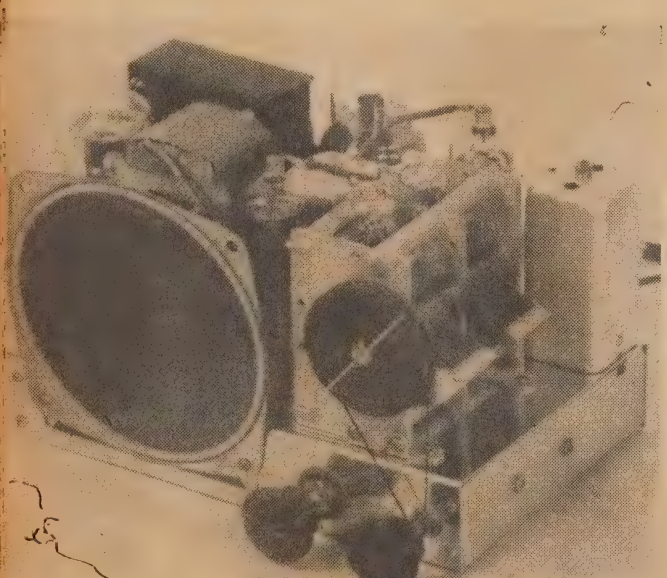


CONSTRUCTION

THE SIMPLEST AND LOGICAL SOLUTION



his picture shows clearly the relative positions of speaker, rectifier, and power trans-ormer. This speaker is mounted from the front—other types carry special mounting pockets.



he tuning end is shown here. You will note how the tuning dial is mounted. No oom has been wasted, but an exact size wiring diagram eliminates the danger of over-crowding.

WHEN we state that this new receiver is the logical mantel set for 1940, we mean exactly what we say!

Ever since the first baby set was produced years ago, all kinds of mantel receivers have been made and sold. All have aimed at the same thing. Some of them have been elaborate little marvels which did far more than anyone ever asked of them. Others were not so elaborate, and not so good. Nearly all of them used circuits much more complicated than were necessary.

We have been doing a little work ourselves on the mantel receiver problem. This new set is the answer. Let us learn something about it.

WHAT IS REQUIRED

Before even commencing to work out circuits, we asked ourselves, "Just what are we after? What are the features our set must have, and which are those it does not require?"

Our most successful experience of small A.C. sets is, of course, the 4/39. This is a table, rather than a mantel, set, because it is about twice the size of the new one. But, then, we made it to include more features in less space than any other of its kind. It was a dual-waver, among other things, and had a very high over-all gain.

Of the hundreds and hundreds of 4/39 sets which have been made up, we have not received one serious complaint. In other words, we must regard it as having done the job with plenty in hand.

THE 4/39

At the same time, we can take it as a good example of the arguments for the new set. The 4/39 was almost too good for a "second set." In solving one problem, it left another unsolved.... We still had not provided a job which anyone could build for the minimum amount of money, and which would give good reception anywhere A.C. was available, a set in which price and size were the most important items—which could be taken into the sun-porch for race results, or into the kitchen for cooking recipes.

And which, if one's radio requirements were humble at all times, would give everything on the air from the locals with the minimum of trouble and fuss.

A set which wouldn't bother over whether it could sound like a symphony orchestra, or which packed so much amplification that when turned full on danced off the table! Just a handy little chap to almost fit in your pocket, and which won't make too big a hole in the said pocket when buying the parts.

THE NEW SET

All these are included in the 4/40, our new set.

In the first place, we know of only one other set in Australia which is smaller. The difference is so slight you wouldn't notice it.

TO THE PROBLEM OF THE SECOND SE

DESIGNED AND DESCRIBED BY

JOHN MOYLE

In the second place, it can tune in all the locals almost anywhere on a few feet of wire lying on the floor. On an ordinary indoor aerial of, say, 30ft., it can tune in interstate stations with no trouble at all.

Then, it is a full-blooded superhet., and is inferior to a larger set only in the audio gain. As we have said, all the mantel sets we know have far more gain than one can possibly use.

It hasn't wasted money on anything more than is actually required to do its job easily and efficiently.

Isn't that common sense?

Its simplicity is such that we'll wager you haven't seen its equal. The circuit is so simple that it cannot be new, and yet it is new! Someone is bound to have used it, but, if they have, they haven't said anything about it!

So successful have been our tests with the 4/40 that we wouldn't be surprised to see it used as the standard type of mantel set for 1940.

COMMERCIAL TROUBLES

It may be that to date manufacturers have fought shy of so simple a design, because their competitors could, by spending a bit more money, make a set with a high over-all gain. The fact that one would never use this extra gain doesn't help. A salesman wants to give a demonstration during which he can out-perform his competitor at all costs! Business is at stake.

But the home-builder needn't worry about such things. He won't lose any sleep because he knows that Tom over the way has a mantel set with more noise ability than his 4/40. He'll know that Tom can't get any clearer reception of the stations he wants to hear. He'll also know that Tom paid up to double the price!

We'll wager that when a few hundred 4/40 sets get under way, some manufacturer will feel like building a set which will do the job it was intended for, and not try to duplicate the performance of the bigger job they use for tuning in London!

SOME CIRCUIT DESIGNS

Before describing the 4/40, we want to say something about possible circuit designs for mantel sets. We have tried most of them, and have a pretty good idea of how they work out.

SPECIAL NOTE!

EVERY now and then, we hit upon a design for a receiver which makes it outstandingly successful. There are reasons why this should be so. This new set is a typical example. There is something which is being released just at the time when it is badly needed. I feel that its various features are in themselves solutions to the many problems which associate themselves with this type of set. Its performance and its price are exactly what one expects of a mantel receiver—no more and no less.

I can personally guarantee it will do exactly what we have claimed for it. After you have examined it through this article, you will agree that here we have got something! I do not claim it as new, although I have never seen this design published anywhere else. But, in my mind, I am quite certain that on its own merits it will shatter all records for a receiver of this kind. I have never been better pleased with any of the many sets I have sponsored over the last few years.

THE EDITOR

Let us take the 4/38, which we built two years ago—a table model set for the broadcast band. This used a 6A8G converter, a 6D6 as I.F. amplifier, and an EBL1 as combined output valve and diode detector with A.V.C.

This made up into an excellent set. We even turned it out as a dual-waver, and on the stronger stations it performed very well. In fact, it was a thoroughly practical circuit, and is still used by some manufacturers.

Our only objection is that for broadcast work it had far more gain and output than was required. The output valve could deliver over 4 watts, and such volume, fed into a baby speaker, is simply ridiculous. The volume control was turned nearly off most of the time.

THE 4/39 CIRCUIT

A development of this set was the 4/39. Here we used a 6K8G converter, a diode-triode-pentode as the I.F. amplifier, and first audio amplifier, with an EBL1 as the output valve, diode detector and A.V.C.

The only difference between the two sets was the addition of the triode section of the 6F7, which bumped up the overall gain a good deal. Enough to give rattling good short wave reception.

But, of course, on the broadcast band we had still more power—much more than we could use.

SIMPLIFYING CIRCUITS

Our job, then, has been to get some-thing out of all this which would have enough gain with the least possible material, so that we could pack the set into a baby cabinet. But how to do it? That was the question.

Don't forget that our set had to be so simple that it just couldn't fail, even when built by a novice. This meant the absolute minimum of parts, and a complete sweep of anything in the way of complicated construction or adjustment. Quite a problem to think about.

OUR FIRST SET

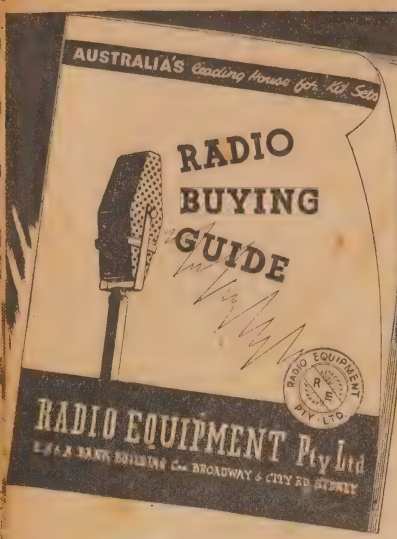
After a good deal of thought, we hit up a job we considered would do what was wanted.

Naturally, there had to be a superhet tuner, in order to provide good selectivity, and allow decent R.F. gain to be obtained reasonably easily. So we started off with a 6K8G converter, 6G8G (6B7S) as intermediate amp. and a diode detector. The point was could we feed the output of the 6G8G straight into an ordinary output valve such as the 6V6G, and get away with it?

After a little thought, and one or two suggestions from interested friends, we adopted a scheme by which we could get good output from this valve with reduced current and reduced grid s

PARTS LIST

- 1 Chassis 8½ x 5½ x 1½.
- 1 two gang tuning condenser, no trimmers.
- 1 midget tuning dial.
- 1 power transformer 320 v HT CT 5 v 6.3 v windings.
- 1 aerial coil, 1 oscillator coil.
- 2 intermediates 465 k.c.
- 1 padder.
- 2 trolitul trimmers.
- 1 1 meg. resistor.
- 1 .5 meg. resistor.
- 1 .05 meg. resistor.
- 1 15000 ohm resistor, 3 watt.
- 1 150 ohm W. Wound resistor.
- 1 5000 ohm potentiometer.
- 2 8 mfds Tubular condensers.
- 1 .5 mfds Tubular condenser.
- 2 .1 mfds Tubular condensers.
- 1 .01 mfds Tubular condenser.
- 1 .0001 Mica Condenser.
- 1 .0005 Mica Condenser.
- 3 octal sockets, 1 4 pin socket.
- Valves—6K8G, 6G8G, 6V6G, 80.
- Speaker—5" electro-dynamic 1500 ohm field coil matched to output valve 500 ohms.
- Sundries—2 knobs, hook-up wire, nuts and bolts, solder, &c.
- 1 special cabinet.


AUSTRALIA'S leading house for Kit Sets
RADIO
BUYING
GUIDE
RADIO EQUIPMENT Pty Ltd
E.S. & A BANK BUILDING cnr BROADWAY & CITY RD SYDNEY

LATEST 1940 CATALOGUE

If you purchase Radio parts, kits, or test equipment, you cannot afford to be without this catalogue. Despite the war, with its consequent fluctuations in prices, we have produced a catalogue which is right up to date with all radio prices. If you are a genuine purchaser of radio goods, this catalogue is free, and post free to you. Phone, write or better still, call for your copy NOW!

"UNIVERSITY" OSCILLATORS

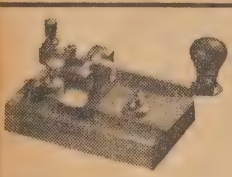
A high class super quality oscillator ideal for aligning and servicing all types of sets. Prices from as low as £5/14/6, plus tax. Terms available.

UNIVERSITY "SENIOR" MULTIMETERS

Exceptionally high quality instruments which you can obtain either as DC kit or built or AC/DC kit or built. These multimeters bristle with features. Write for descriptive leaflet. Prices from £4/8/6, plus tax. Terms available.

UNIVERSITY "STANDARD" MULTIMETERS

DC multimeters, inexpensive yet quality—alive with good points. Build them yourself from the kits we supply. Send for descriptive literature. Prices from £3/17/6 plus tax. Terms available.



MORSE KEYS

Precision engineered, high quality P.M.G. type. Amazingly low price, only 16/6. This quality cannot last long at this price.

PK4 PORTABLE 4 . . .

The portable of the year. You can build it yourself from a Radio Equipment quality kit. All the very latest and many exclusive features. This portable beats them all. Write for illustrated literature. It's easy to build, at easy to pay prices.

We are specialists in ALL radio kits. Get the habit of getting the Radio Equipment quote first.
Extra special April prices for these kits:

- THE LITTLE GENERAL
- DUPLEX TWO
- PORTABLE PENTAGRID 3
- SIMPLE SIMON
- DE LUXE RADIOGRAM 5
- DUPLEX SINGLE
- SUPER ADVANCE 6

Send your orders to Australia's leading mail order specialists.

RADIO EQUIPMENT PTY. LTD.

E.S. & A BANK BUILDINGS, BROADWAY, SYDNEY.

'PHONES: M6391—M6392 (at your service). Telegrams: RAQUIP, SYDNEY.

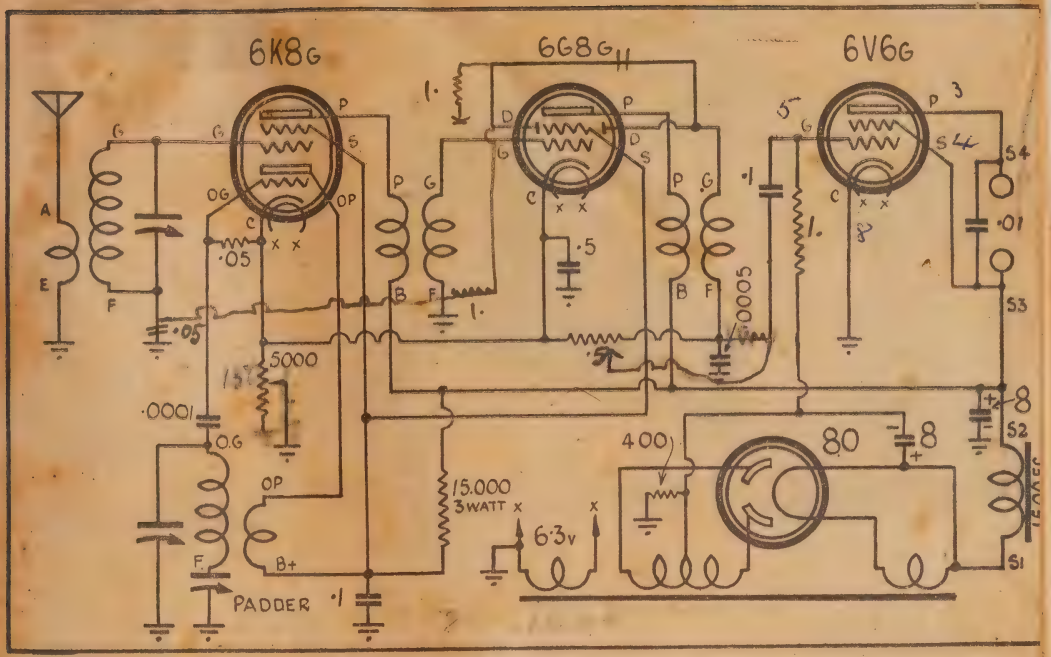
Dear Sirs,

Please send me without obligation on my part, your free Radio Buying Guide. At the same time, please quote for .....

NAME .....

ADDRESS .....

R. & H. 4/40



The circuit is the very essence of simplicity. There are no critical adjustments of any kind. It is probably the least complicated four-valve circuit which could be built.

It was done by reducing the screen voltage of the 6V6G to about 100 volts.

This meant, of course, a drop in maximum output to about 1½ watts—still more than enough for the baby speaker we had to use. At the same time, it reduced the required grid swing of the valve to about 4.5 volts, and the current drain well below the usual figure of 40 odd mills.

IT WORKED!

To cut a long story short, it worked! We hadn't the slightest trouble in overloading the 6V6G on all the local stations, and as the R.F. gain of the set was just as good as that of larger models, distant stations were no trouble at all. The only difference was that we couldn't wreck the speaker on 3LO—it just came in at nice volume!

So delighted were we at the success of our scheme that we decided, if possible, to abandon the rather awkward idea of reduced screen voltage, and run the 6V6G on its standard ratings. Although the signal generator may have shown some difference, we could not hear it. Everything seemed unchanged, except that we could get rather better tone and output from the altered circuit.

Just think for a minute what had been done! Here was a set, with a single resistor dropping the voltage for both screens and oscillator plate. A simple potentiometer was the volume control. A diode load and grid leak for the output valve were the only other resistors, apart from the bias resistor. A few condensers, and there was the entire circuit!

Originally, our idea was to make use of the low current drain to employ the smallest possible transformer. We had one built to deliver 30 mills.

But when we came to lay out the set, and found it squeezed into a chassis only 8½ by 5½ inches, there was still plenty of room to use the same 40 mill transformer we had made for the 4/39. A little over-bias on the 6V6G, and the drain of our set was within that limit, or near enough to it.

> Maybe we have underrated the Little General." One night recently, we heard a programme from 3GL Geelong, among others, at full loud speaker strength! The aerial was very poor, and about 20ft. in length. Now then, boys, where are your logs?

The job was done, and all the parts used are available at this moment from any radio store.

The finished receiver amazes everybody with the clean, clear output it produces from all stations. It is safe to say that in most locations it is possible to overload the speaker without turning the volume control flat out.

On the standard interstate stations, the only difference, as we have said, is that these can't be played quite as loudly as on a more elaborate set. Son how, we don't think that is going worry anybody. In fact, we will l to see the day when someone sends a list of stations he has heard on 4/40 as long as your arm! Just wait!

OTHER ADVANTAGES

There are, of course, other advanta with the idea.

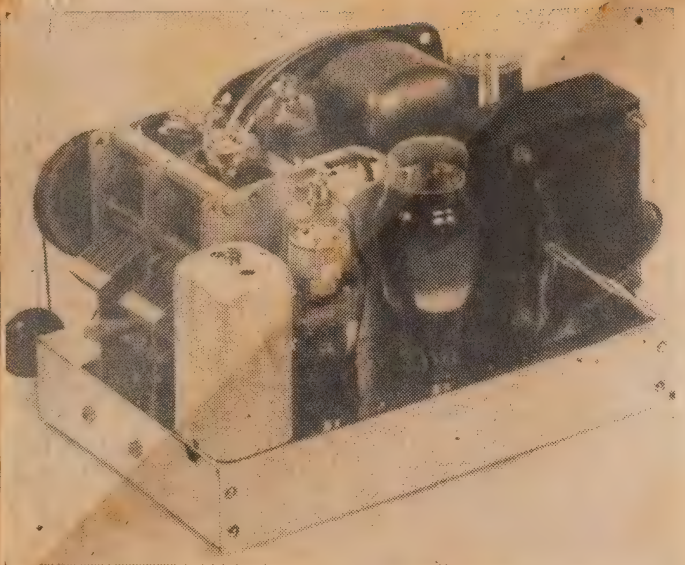
In the first place, as we have said, of the problems with mantel sets always been the matter of hum. T tiny loud-speakers have only a few h ries inductance, and as filter cho they are pretty poor.

Now, hum is a thing which goes ha in hand with audio gain. The hig the audio gain, the more likely is hum to worry us.

But this set has, comparatively, a audio gain. Only the 6V6G is to taken into account. As a result, hum level is practically non-existent

We have made tests with this set, which the volume was purposely turn so low that one could hardly listen t without straining the ears. Even this low output, the hum level could be heard through the signal! Not m mantel sets can do as much as this.

Again, the power transformer has output of about 320 volts at full lo The use of a 1500 ohms field reduces t to just about 250 volts. That means t the filter condensers are under a lo strain than with a larger receiver. T easily mounted tubular types are t working well within their ratings both sides of the field.



A rear view of the Little General. The second I.F.T. is in the foreground, then come the 6G8G and the 6V6G. Aerial and power lead come through the rear of the chassis.

No decoupling is required anywhere in the receiver. Feedback problems are completely solved by a good-sized by-pass condenser across the speaker—necessary, anyhow, to tone down the high-pitched effect of the straight beam-power valve. Nothing could possibly be more foolproof.

BIAS FOR THE 6V6G

Biassing the output valve is again very simple. A plain back-bias scheme is perfectly adequate, and allows another bypass condenser to be omitted. Any worries about hum just don't enter the picture.

The use of the tubular filter condensers does away with any need to insulate the first electrolytic from the chassis. Having pigtail ends, these are soldered direct to the valve sockets, and a lug on the insulated strip, which holds the bias resistor and screen dropping resistor. But don't get these condensers connected the wrong way round.

VOLUME CONTROL

There is no A.V.C. on this set. In the first place, it isn't necessary. One of the most popular baby sets now sold by a reputable manufacturer uses the same simple system of manual control we adopted for this set. We have simply wired a variable resistance in the cathode circuits of the 6K8G and the 6G8G. It gives perfect control without bother.

Another point why A.V.C. would not be desirable. The local stations will develop quite a high voltage across the diode load of the detector. Unless we went into complicated hook-ups, this would tend to keep the maximum volume we could get too low. It would be quite all right with a set having more audio gain, but out of place here.

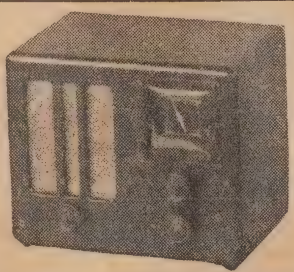
As a result, we are able manually to bring the set right up to maximum

Easy to Build—

1939 DUPLEX SINGLE

A remarkable performer, will operate a speaker on the more powerful stations.
New type valve results in extreme battery economy.
Complete kit, including valve and batteries £5
6in. permag. Speaker .. . 26/-
Headphones, from 6/11

PENTAGRID PORTABLE THREE



A first class portable. It is compact, and the weight is not excessive. Three new type valves give the results of four, with low battery drain.
Complete kit, including valves, batteries and speaker £8/17/6
Carrying Case 26/-

OTHER POPULAR KITS

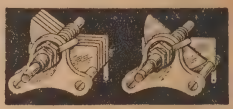
Pentagrid Three ..	£10/12/9
Simple Simon	£6/10/-
Tiny Tim	£5/12/3
4/39 Dual Wave ..	£9/5/9
Little Jim	£3/3/6
Little Jim's Mate ..	£3/1/9
The Little General ..	£8/2/6

Write for detailed lists

FOR YOUR SHORT-WAVE SET

Radiomac

IS THE BEST CONDENSER



15mmF.	5/9
40mmF.	6/3
160mmF.	8/-
250mmF.	8/9

Brass Plates—Ball Bearings, Trolutol Insulation.

PRICE'S RADIO

5 & 6 ANGEL PLACE, SYDNEY

Rear of Challis House

sensitivity, should this be required, and shut it right off if we want it that way. And no circuit could be simpler.

VOLUME CONTROL BYPASS

You will notice that the bypass on the volume control is only .5 mfds. If we worried about the best bass response, we would need a higher capacity here (as well as a .1 mfds. for an R.F. bypass), because the 6G8G diodes are in the audio circuit.

However, in the first place, small speakers aren't suited to much bass response. The small cabinets can't do much about it even if it was there, and, lastly, the .5 mfds. bypass, besides being enough for our purpose, serves as an R.F. bypass as well. One more component saved.

You can try the experiment of including a 25 mfds. condenser in parallel with it if you care to. We'll wager you won't notice the difference.

SCREEN-DROPPING RESISTOR

Note that we have specified a 3-watt resistor to drop the voltage for screens and oscillator plate. The power here is between 2 and 3 watts, and a 2 watt resistor might give trouble in the long run, if operated at the overload. Small sets like this must of necessity run rather warm all round, and safety margins are very comforting things to have.

The main reason we used the 6K8G was that both screen and oscillator plate require about 100 volts, which may be obtained from the same point. A 6A8G would require two dropping resistors instead of one, or, alternatively, a voltage divider. This latter is out of place in a baby set.

THE DIAL

The dial is, of necessity, the smallest we could find. This is the same type as was used in the Pentagrid Portable, and it takes up very little room. There are no stations marked on it, but this doesn't matter much, as everyone knows just where the locals come on the dial, and it is unnecessary to actually log them every time. Calibrations are on a 0-100 scale, and also on a kilocycle scale for approximate readings. As you see, it is quite a handsome little unit, and very easily mounted. Only a drum to be fitted to the condenser, and a spindle to be mounted on the chassis to take the cord drive.

THE COILS

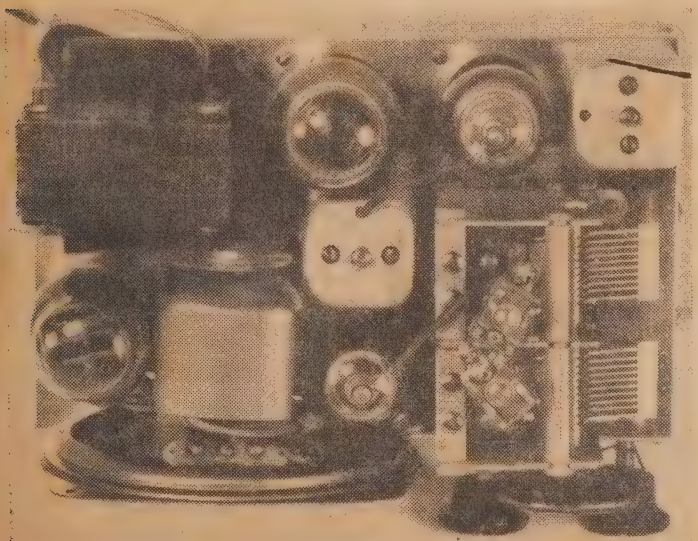
The coil kit is a standard 465kc. type for the broadcast band. Any of the small-can types can be used. There is nothing critical about the intermediates. As we are not bothering about extreme sensitivity, there is no need to use high-gain iron cored types. The ordinary air-cored coils are quite suitable. If you are placed where the extra gain might be handy, you can use the high-gain intermediates without alteration. Simply please yourself—in the city and suburban area, we doubt whether you could tell the difference for ordinary listening.

The tuning coils are mounted on their sides under the chassis, and the intermediates as indicated on the wiring diagram.

OTHER PARTS

The speaker is a standard 4-inch or 5-inch component, with a field winding of 1500 ohms, and an input impedance of 5000 ohms. Any of the leading makes should fit this chassis, as we used what we believe is the largest of all the available types. The difference in size is very little.

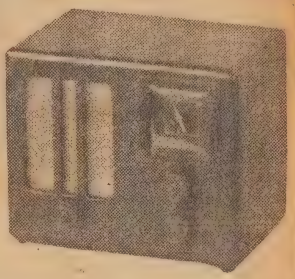
The power transformer is the same type as was made for the 4/39. It has leads for direct connection into the set.



This plan view shows all the leads above the base. The two trolitul trimmers are also visible mounted on the gang condenser.

CABINET BY WESTERN

Specially made for all R. & H. RECEIVERS



THE 4/39 WITH ITS WESTERN CABINET

Cabinets may be obtained for the original "R. & H. Portable," the "4/39" Mantel set. "The Pentagrid Portable" and "Tiny Tim."

FOR YOUR "LITTLE GENERAL"

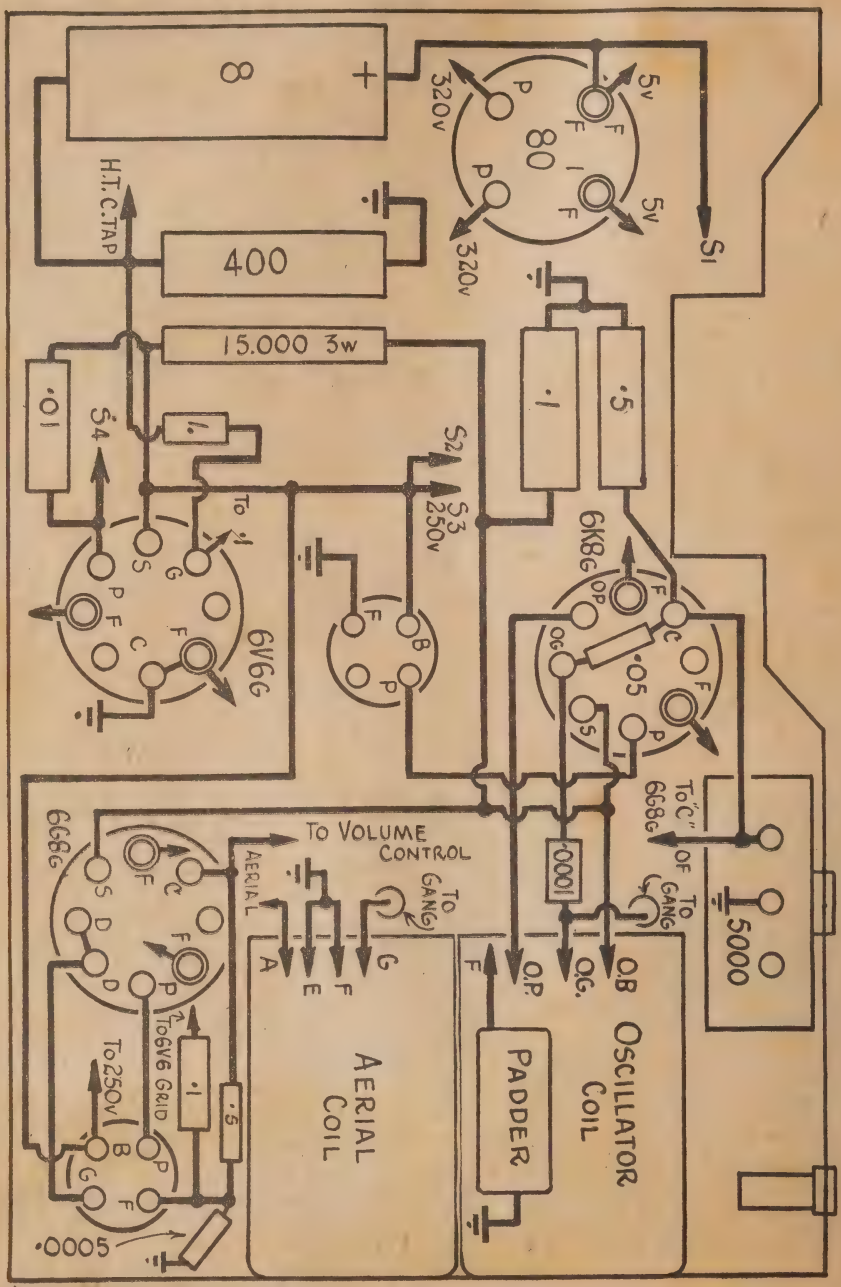
Made specifically to dimensions supplied by the Technical Editor, Western can supply you with a cabinet for your "Little General." A variety of colors is available—red, green, brown, black, etc. Complete with carrying handle and lid.

THE WESTERN MFG. CO.

THIRD AVE., FIVE DOCK.

'Phone, UA3444.

This is an exact size wiring diagram which can be used as a template when cutting the main holes. The chassis measures 8½ x 5½ inches. One 8 mfds electrolytic, from H.T. to chassis, is not shown, and actually the padder is mounted across the 6K8G socket.



The speaker leads are also wired directly into the chassis.

The gang is a standard type, with a pair of midget trimmers mounted on each section to line up the coils.

The bias resistor is a wire-wound type, the dropping resistor a 3-watt type, and all the others may be the small ½ watt size. These take up less room than the 1 watters, although the latter can be used.

CONSTRUCTION

Building the set should be simple. We have shown an exact size wiring diagram of the chassis. After all the holes were cut, we traced out the exact positions of all the socket holes, etc., so you can exactly duplicate it for yourself. The section cut out for the speaker should allow any type to be mounted. A few minutes work with a file will remove any tiny bits that might be in the way in your particular case. Our chassis was of aluminium, but a steel counterpart is just as good, and somewhat stronger.

The gang is mounted hard on the chassis. Make the connections to the stator plates before bolting it down.

The volume control is a Marquis—we mention this because it only just squeezes into place. Other makes might be larger, and cause some trouble. We removed the dust-cover to make it still smaller, although this may not be necessary.

The tuning coils are held in place by the bolt which holds the can to the coil assembly. They are quite firm when held this way.

Note the little insulated panel for the bias and screen-dropping resistors. In the wiring diagram, the only component not shown is the 8 mfds. from high tension to the chassis. As the components overlap each other somewhat, it would be rather hard to show it in the drawing. Also, the padding condenser actually covers up the 6K8G socket, as it is earthed to a solder lug under one of the bolts holding this socket to the chassis. Naturally, if we drew it in that position, we could not show connections to the socket as well.

There is no need to shield any of the valves, although a can could be placed over the 6G8G in some cases.

We found it necessary to bend one of the lugs holding the speaker transformer to the speaker housing, in order to clear the 6K8G. A pair of pliers will fix this. Our speaker was bolted to the front of the chassis by means of the mounting holes in the frame. Other speakers have a bracket which may be used instead.

THE CABINET

We have had a special cabinet made for this set—as you can see, it is a particularly handsome one. The balance of the speaker fret and the dial is excellent, and your finished set will stand comparison with any other for appearance.

A good plan is to place a piece of asbestos above the speaker and down the side of the cabinet next to the rectifier. This is rather a hot part of the set, and it might make the cabinet's life a little easier if you do this. Ours

MARTIN de LAUNAY'S SERVICE makes awkward jobs easy!

WE say OUR service is good. It's fast, it's money-saving, it's prompt, helpful, courteous and attentive. And more than that—it's INTELLIGENT.

Sounds as if we're conceited doesn't it? Yet we're only repeating what thousands of customers have told us during the 24 years we've been in the wholesale end of the radio and electrical industry.

Yes, we're proud of the efficient organisation we've built up. Get us to work for you, too. One trial order is all we ask.

MARTIN de LAUNAY Pty. Ltd.

CR. DRUITT AND CLARENCE STS., SYDNEY.

M2691 (5 lines). And at Newcastle and Wollongong.

AMPLION

ELECTRICALLY WELDED

LOUD SPEAKERS

SET A NEW STANDARD IN HIGH FIDELITY REPRODUCTION!

1940's greatest Technical advancement in loud speaker production has been made by Amplion with their revolutionary "electric welding" process. Electric Welding ensures that all Amplion Speakers possess outstanding fidelity and sensitivity because the entire magnetic circuit is projection welded to provide an absolute minimum of magnetic leakage, reduced reluctance and increased sensitivity.

ONLY AMPLION IS ELECTRICALLY WELDED!

The

BIG 7inch

Amazingly efficient, the BIG 7-inch Amplion supersedes 6½ and 8-inch types, and handles outputs of 8 watts undistorted and 12 watts maximum. Special moulded fibrous cones; large oversize fields; sealed impregnated transformers; completely dustproofed.

7E12—7-inch electro **31/-**

7P14—7-inch permag 14oz. magnet **40/6**

New

5inch Type

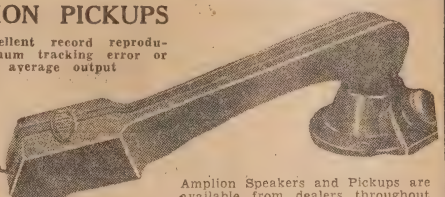
Specially suited for portable and midget sets, this speaker gives extremely good bass response. Cone area is 30% greater than any other 5-inch, power handling is 3-5 watts. Oversize field coil, sealed insulated core transformers, completely dustproofed.

5E7—5-inch electro, **28/6**

5P8—5-inch permag with 8oz. magnet **31/6**

AMPLION PICKUPS

ensure excellent record reproduction, minimum tracking error or wear, with average output of ¾-volt.



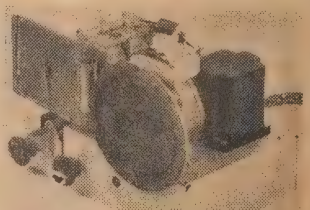
Price 37/6, Complete with Arm, Volume Control and Pickup Rest.

Amplion Speakers and Pickups are available from dealers throughout Australia, or write direct to

AMPLION (A'sia) Pty. Ltd., 382 Kent St., Sydney

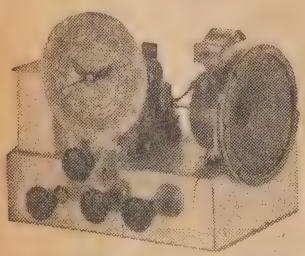
A humble APOLOGY

is extended to the hundreds of our clients who were slightly inconvenienced recently by the late despatch of their valued orders for Invincible Kitsets. We regret the delay which was caused by the phenomenal demand, but hasten to assure our customers that steps have been taken to cope with the rush and all present and future orders will be despatched the same day as received.



THE DUPLEX SINGLE

Excellent reports to hand from all parts of Australia. Overseas stations simply roll in. Build it yourself, it's simple. Let us quote you—our prices are right! Invincible Kitsets comprise only the actual brands of components as used by the Technical Editor in his construction of the original models.



THE LITTLE GENERAL

The actual set was in operation at our showrooms and its performance was superior to that of much larger and well-known brands of receivers. For tonal quality, volume and long-distance reception, this outstanding 4-valve Mantel Radio is the finest set ever to be described in Australia. Write for our detailed price list. Invincible Kitsets are complete to the last nut and bolt.

THE TINY TWO

Easy to build—costs little to run. Write the various brands of highest quality comthe various brand of highest quality components, all of which are included in all Invincible Kitsets. Deal direct with the Kitset Specialists.

IMPORTANT

INVINCIBLE Kitsets are available for every article published in this magazine and should there be information required for any particular model—just let us know, and we will be only too pleased to assist in every way possible. With an INVINCIBLE KITSET—YOU CAN'T GO WRONG.

Same day mail order service. All goods carefully tested before despatch.

Invincible Radio & Electrical Pty. Ltd.

SHOWROOMS: 102 CLARENCE ST., SYDNEY. PHONE: BW 4115.

hasn't shown ill-effects after a couple of weeks' running, however.

Don't worry if you find the whole set gets warm. There isn't a mantel set alive which runs really cool. There is too much heat generated by valves and transformer to make this possible. It won't hurt the set.

OPERATION

Having finished your wiring, and made sure everything is in order, switch on, with your eye on the rectifier. If it doesn't get red-hot, or show blue sparks, or anything of that nature, you can assume all is well. On advancing the volume control with an aerial attached, you should hear some station.

Back off the padder about three turns, and line up the aerial trimmer on a station such as 2SM. Now swing up to 2FC, and adjust the padder till you get the best volume.

Come back to 2SM, and re-line the aerial trimmer, if necessary. That is all there is to lining up.

If you tune in a weak station near the bottom of the dial, you can get rather a finer adjustment of the aerial trimmer. The intermediate trimmers, also, may be carefully adjusted for best results, but these should require very little attention, if any. It's a good plan to leave them alone, if the set goes well.

AERIAL

For local work, quite a small indoor aerial will be sufficient. We have been using about 12 feet of wire trailing on the floor. Naturally, a longer aerial will give better results, particularly if one of the locals is rather weak where you happen to be, as is sometimes the case. You will note that, if the volume control is advanced to the limit, the set will lose volume, and possibly cut out altogether.

This is generally avoided by including a limiting resistor in the cathode lead, to provide always about 300 ohms in circuit. As long as you remember this, however, you won't get panicky about it. You'll never need to go "flat out," anyhow, so we didn't bother about the extra component.

If you use high-gain intermediates, the set may even oscillate before losing gain. If so, try a valve can over the 6G8G. This should fix it. But, as you won't work the set with the control so far advanced, it's hardly worth the trouble.

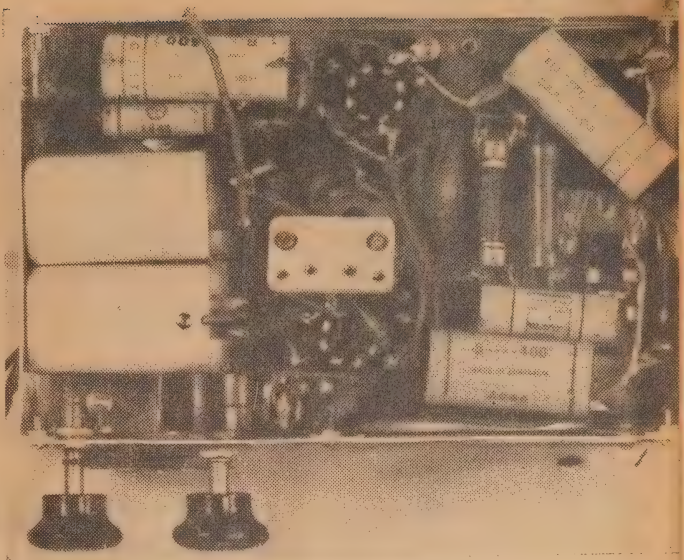
Don't hesitate at all about making this set, even if you aren't very experienced. It has been designed specially for you, and every possible "bug" has been ironed out. Built to specifications, it is almost impossible for you to fail.

And, when you have it going, you will have a mantel set which is as modern as the minute. Its very nature assures you of long and trouble-free service. We consider it one of the most effective and thoroughly practical designs we have ever sponsored. And them's big words!

So keen are we on the performance of this little set, that we were considering very seriously offering to let anyone hear it at our offices, so that they could learn for themselves how well it behaves. Unfortunately, this is not possible, as we fear there would be so many visitors that our work would be seriously affected!

However, we understand from several of our advertisers that duplicates of the original are being built up as we go to press, and these firms extend an invitation to all interested people to pay them a visit.

Naturally, the limitations imposed on the set by working it in the heart of the city won't allow any feats of distance to be displayed, but while demonstrating it to several of these firms, we were able to tune in most of the local stations, inside various city buildings and with a few feet of aerial. If you would like to hear the 'Little General' before making it up, here is your opportunity. We can guarantee you will not be disappointed!



A photo showing components under the base. Note position of padding condenser. It is earthed to a solder lug clamped under a bolt holding down the 6K8G socket. The 8 mfds. not shown in the wiring diagram is seen here in the top left hand corner. The 1 watt 15,000 ohm resistor seen here should be replaced with a 3 watt type.

COIL DATA FOR SIMPLE SIMON

THE coil data for Simple Simon, which unfortunately, was omitted from our March issue, is as follows:—

Broadcast Coil: 15 turns Aerial; 110 turns Grid; 25 turns Reaction. All wound with 32 gauge enamelled wire.

Short Wave Coil: 5 turns Aerial; 5 turns Grid; 8 turns Reaction. All wound with 26 gauge D.C.C. wire.

Both coils are wound on an 1½-inch former.

★ ★ ★

THE Model Aeronautical Association meets the first Thursday in every month at the Industrial Art Society rooms, Victoria Chambers (next door to the Prince Edward Theatre, in Castlereagh-street). Every interested model builder is invited.

How To Instal A Burlgar Alarm

THE BRITEX AUTOMATIC BURGLAR ALARM

can be fitted in any home or shop by an inexperienced person. Supplied complete with all necessary fittings and full instructions £2/8/6

Write for illustrated pamphlet.
This alarm is battery operated and can also be used as an ordinary door-bell.
Burglar-proof your premises and save money.

MORSE CODE PRACTICE SETS

De Luxe model with signal light and high tone buzzer 25/6
Scout models .. .. 9/6 and 12/6
Morse keys only from 4/6 to 32/6
High tone buzzers 3/9 and 5/6
Trade inquiries invited.

KIT SETS

Write to us for complete detailed price lists showing the individual prices and the ready wired and tested cost of the various sets described in this issue and all previous issues of "Radio and Hobbies." Your requirements will be posted to you without obligation post free.
Radio House Pty. Ltd., 296 Pitt-street, for all radio and electrical requirements and quick service

RADIO HOUSE PTY. LTD.
296 Pitt-street, Sydney.
6 Royal Arcade, Sydney.

MORE ABOUT MAKING ELECTRIC FENCES

Our article on the construction of a simple Electric Fence has roused considerable interest among our country readers. Since the publication of the article, we have had a steady stream of letters from those who have tried out the scheme, or who have suggestions to make.

As we mentioned in last month's issue, we have been conducting some experiments ourselves with the device, and it has proved particularly effective. The unit, which was shown last month, has been in regular use ever since it was installed, and is used mainly to confine a number of pigs within their prescribed area.

An element of humor was introduced when the fence was given its first test. The pigs were placed in the enclosure, and, in order to avoid being "bitten" ourselves, the current was left turned off during this operation.

The pigs, however, showed great contempt for the flimsy-looking wire between themselves and freedom, and one was actually half-way under the wire when the battery was connected.

PIG LANGUAGE!

Not being well up in pig-language, we are not able to translate his remarks. However, they were very terse and to the point! No pig ever extricated himself from a wire in quicker time than did this one.

The net result was to instil into his porcine mind a very healthy respect for fences, flimsy or otherwise. In a very short space of time, nothing would persuade the animals to come to grips again with the wire. In this particular case, at least, it proved to be one hundred per cent. effective!

As mentioned earlier in the piece, trouble was experienced, due to the voltage jumping across the rather small insulators we used for a start. When these were replaced with larger types, which provided a much bigger path for the spark (if any) to jump, this trouble was completely overcome.

So far, our fence has been operating from a large 6-volt accumulator, which, no doubt, is responsible for its rather hefty "bite." This accumulator lasted several weeks on one charge with quite constant use. This leads us to believe that large dry cells could be used if the fence is not intended to be in action for long periods at a time. Nor is this necessary, for the animals will not go near the wire after they have been trained to it.

NEW IDEAS

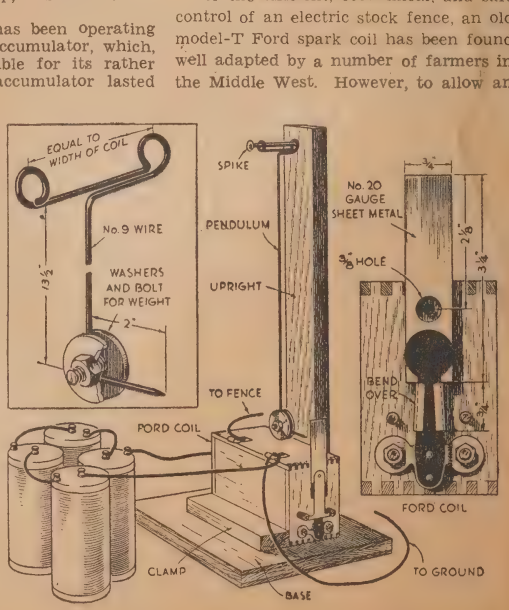
In a recent issue of "Popular Science" we came across a couple more suggestions for providing intermittent operation of the contact-breaker. One of these uses a pendulum suspended from above, and the other uses a large balance wheel to obtain the same result.

These need a little more work to get them going, but each has definite advantages. They would probably provide a cleaner and faster contact, thus saving battery current by limiting its flow to the smallest possible fraction of a second during each impulse.

We are reprinting the ideas from "Popular Science," as we feel sure they will be of the greatest interest to hundreds. Considering the small cost involved, it will pay every man on the land to investigate the Electric Fence.

A PENDULUM BREAKER

For the efficient, economical, and safe control of an electric stock fence, an old model-T Ford spark coil has been found well adapted by a number of farmers in the Middle West. However, to allow an



Here is a working diagram of the pendulum type unit. It is very simple to construct and has practically nothing to go wrong. The re-vamping of the contact breaker is very simple and involves no difficulties.

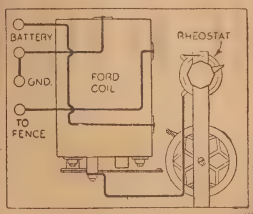
animal to recover from the shock and step away from the wire, the coil must be modified to make and break the circuit at intervals of about one second.

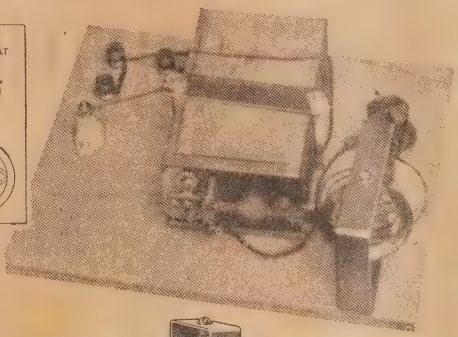
An easy way to accomplish this is by using a pendulum. Each time it swings, it brings the coil points together and causes a high-voltage charge to surge through the fence wire.

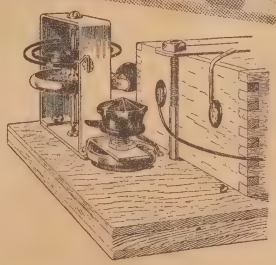
At the same time, the inner coil point is drawn sharply back by magnetic attraction, and this gives the pendulum a flip in the opposite direction, so that the operation repeats itself with clock-like regularity.

MATERIALS

Materials: 1 model-T Ford coil; 3 old "B" battery clips; 1 pce. sheet iron 3in. by 4in.; from 1 to 4 dry cells, or a 6-volt storage battery; 30in. of No. 9 iron wire; 1 spike; 1 machine bolt, 3in. long; 2 iron washers and a few small nails; 5ft. insulated battery wire; 1 knob insulator for each post 50ft. apart; 1 pine or plywood base, 1in. by 8in. by 12in.; 1 pine clamp, 1in. by 1in. by 6in.; 1 pine upright, 1in. by 2in. by 24in.; and the necessary fence wire.







Details of the electric fence using a fly-wheel to make and break the circuit.

ALTERATIONS TO COIL

To alter the coil, simply remove the points and extend the inner one by clamping on a piece of sheet iron. Replace the outer point, but do not tighten it so that it is in contact with the inner one. Solder old battery clips to the coil posts.

Now mount the coil as shown and add an upright to support the pendulum, which is bent from wire. File the end to a sharp point and bolt on the two washers. Drive a spike to support the pendulum so it clears the coil by about 1in.

HEIGHT OF WIRE

The fence wire must be well insulated and about two-thirds the height of the animals from the ground. In some cases, as when there are hogs and horses in the same field, it may be necessary to use two wires.

It is best to make a complete circle with the wire; then if it breaks in one place all the fence is still effective. To test, stick one end of an iron rod in the ground and bring the other end near the wire. No spark indicates that the wire is broken or grounded.

Before being turned into the field, the stock should be trained in a small lot with an electric fence wire around it. Then they will respect the "hot" wire.

USING A BALANCE

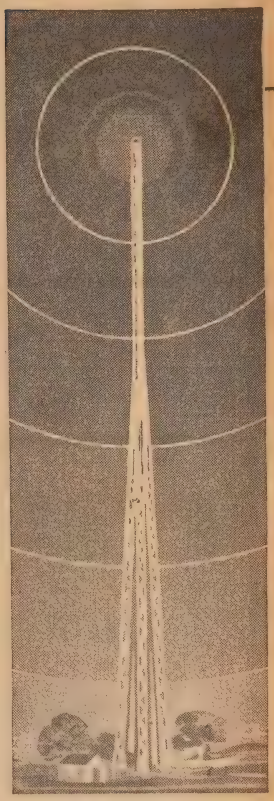
Those who wish something more compact and easily adjusted than a pendulum for regulating an electric fence can construct a balance-wheel control.

The outer point of the model-T Ford coil is removed, and the inner one extended so as to reach out over the edge of the coil. This is done by cutting off part of another point and soldering it to the regular one. Note that this contact is turned to face the opposite way from the original one.

IMPROVISED FLYWHEEL

Any heavy wheel about 2in. in diameter will serve for the balance wheel. The one shown is a lead wheel taken from a gyroscopic toy. The contact taken from the outer coil point is soldered to one side of the wheel. The spring, which acts like the hairspring of a watch, may be the mainspring from a watch. The weaker the spring, the slower the wheel will swing.

Mounted below the wheel is a 3-ohm radio rheostat. By adjusting it, the wheel can be made to swing no farther than necessary.



SPECIFIED for
3LO and 2FC

In the construction of these, and other, powerful national transmitters complete reliability was of profound importance. Hence Ducon condensers were specified.

The Ducon-Chanex name will guarantee you the same efficient, trouble-free service.

Ducon willingly co-operates with engineers to ensure correct types and ratings.

DUCON-CHANEX
CONDENSERS & RESISTORS

ADVERTISEMENT

it's the Finest I've seen in a

PALEC EQUIPMENT IS RENOWNED FOR ITS SUPERIOR STANDARD, DURABILITY AND REASONABLE PRICE

Palec Model VCT
Complete Valve and Circuit Tester.

Palec Model VCT
Complete Valve and Circuit Tester

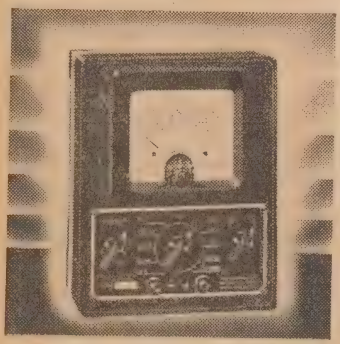
This instrument is outstandingly successful because it tests all types of valves, and contains circuit and component testing facilities that make additional instruments . . . except for alignment purposes . . . not altogether essential. It is compact, well engineered and attractive in appearance, is fitted with a large accurate meter with long legible scales; is simple and fool-proof to operate, and is very reasonably priced.

Models and Prices

MODEL "VCT" for operation on a 200-250 volt A.C. supply .. £15 10 0

COUNTRY MODEL "VCT" (dual operation) works with equal efficiency when connected to either the A.C. supply or to a 6 volt accumulator. This model is ideal for service work in districts "off the line." Complete with built-in Vibrator Unit £17 17 0

NOTE: The model "VCT" can be supplied fitted into a counter type steel case similar to the model "MV" Valve Tester at £1 additional.



Model "M" Series Multimeters.

Model "M" Series Multimeters

A solid cast aluminium case measuring 8in x 6in. x 2½in. is used to house all four types. The basis of each instrument is the new "PALEC" model "K400" rectangular moving coil Meter, which gives excellent accuracy and legibility on a scale 3½in. in length.

RANGES:—Volts, 10-50-250-1,000 v.
Current, 1-10-50-250 MA's D.C.
Resistance in three ranges from a quarter of an ohm to 1.5 megohms.

Model "MCD" .. 1,000 ohms per volt .. D.C. only £4 15 0

Model "MCA" .. 1,000 ohms per volt .. A.C. and D.C. volts £6 17 0

Model "MXD" 10,000 ohms per volt .. D.C. only £6 15 0

Model "MXA" .. 10,000 ohms per volt .. on both A.C. and D.C. volts £8 17 0

Leatherette covered case available, 15/- extra.

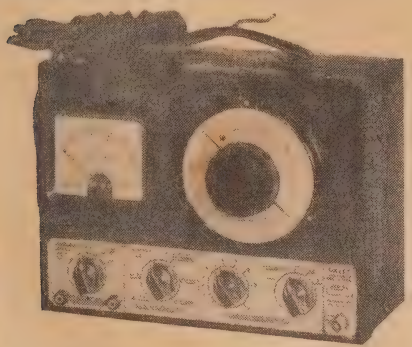
NOTE: ALL PRICES ARE SUBJECT TO ALTERATION WITHOUT NOTICE

OBTAINABLE FROM ALL LEADING DISTRIBUTORS

testing gear long time!

The Palec VCT valve and circuit tester, together with the new "G" series All-Wave Oscillator enables every conceivable test and adjustment to be made on all types of radio receivers. For a comparatively small outlay, servicemen and experimenters will find in this equipment all that is necessary for complete testing.

Palec instruments are highly efficient and are very easy to operate . . . being equally effective in the hands of expert and non-expert alike. Any distributor will be pleased to demonstrate Palec equipment entirely without obligation.



Palec "G" Type All-Wave Oscillator

This modulated oscillator is outstanding because it embodies several important features hitherto exclusive to high-priced signal generator instruments.

FREQUENCY RANGE: 160 Kc to 24 Mc in SIX BANDS as follows: 160-300, 400-800, 800-1,600 kilocycles and 3-6, 6-12 and 12-24 megacycles. It will be noted that an unusually low frequency ratio is maintained throughout (2-1). This allows for a well spaced, uncrowded direct-reading dial.

ACCURACY: A frequency accuracy of 0.5% may be expected with a guarantee of 1%. This degree of precision with a DIRECT-READING dial is exceptional.

ATTENUATOR: The special attenuator network consists of a continuous variable control (calibrated 0-10) and a four step ladder (calibrated x1, x10,, and x100 and High Output) network. The impedance of the above is both constant and low (45 ohms), a feature being the reliability of REPEAT READINGS.

MODELS

Model GA	A.C. Operated	£11	15 0
Model GAO	A.C. Operated with built-in Output Meter	£15	15 0
Model GAV	A.C. Vibrator, dual operation from power supply or 6 volt accumulator	£13	15 0
Model GAVO	A.C. Vibrator with built-in Output Meter	£17	15 0
Model GB	Battery operated	£11	15 0
Model GBO	Battery operated with built-in Output Meter	£15	15 0

Manufactured by:

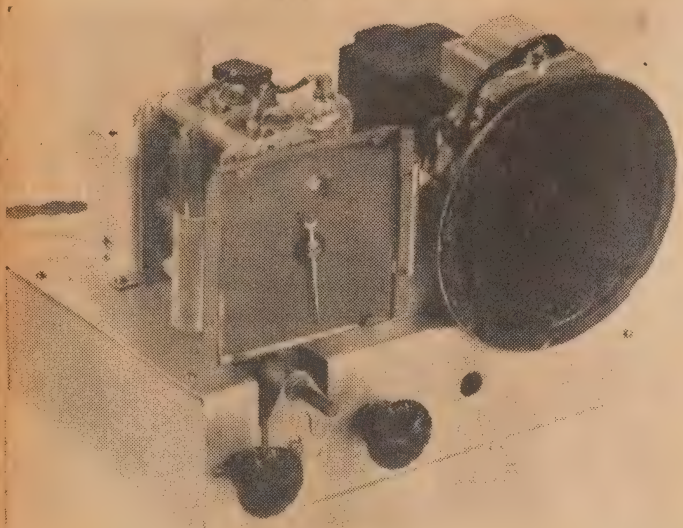
PATON Electrical

PATON ELECTRICAL PTY. LTD., 90 VICTORIA STREET, ASHFIELD. 'PHONES: UA 1960...1982

A.C. ADVT. R.H.P.I.

CONSTRUCTION

THE TINY TWO BATTERY RECEIVER



The layout of the chassis allows this set to be housed quite easily in a small cabinet. As such, it would make quite a neat little set.

Here is a receiver intended primarily for beginners, which is easy to make and which has an excellent performance. Although it has good range due to the use of an R.F. stage, it should not be used where long distances are to be covered. It is, however, much more sensitive than the "Duplex Single," which can easily be remodelled for this circuit.

LAST month's immediate success of "Simple Simon" has firmly convinced us that small sets of this type have a definite appeal to the majority of our readers.

No doubt this success was the result of the simple, concise manner of describing the set. Inquiries to date indicate that it will be a serious rival to the already famous "Duplex Single."

So here is another small battery set which should prove just as popular as any of the others.

WHY WE BUILD BATTERY SETS

Before giving any constructional details about this set, a few general remarks will not go amiss.

Naturally, to the experienced builder who usually can only think in terms of five or six valve sets, these simple circuits are quite commonplace. But to a beginner, who perhaps has never previously built a set, they are invaluable.

Whilst a beginner may doubt his ability to build a larger electric set, he knows he can start off with one of these small receivers and be confident of it working successfully.

The advent of the 1.4 volt series of valves is another reason for describing these sets.

Since these valves only need 1.4 volts for the filament and 90 volts maximum for the high tension, we have been able to develop very efficient circuits around them, and yet keep the operating costs to a minimum. And running costs are quite an important factor for many of us.

As the sets are battery-operated, any electrical dangers which would normally be present in A.C. sets and which cause trouble for a beginner, have been eliminated.

PARTS LIST

1 Chassis 9 x 6 x 2½.
1 Two-gang condenser with trimmers.
1 100 mmfds. midget variable condenser.
1 Set coils—1 Aerial, 1 R.F., with reaction.
1 Tuning-dial.
1 Audio transformer.
1 Filament switch.
1 R.F. choke.
1 Two-meg resistor.
1 .25 ohm resistor.
1 .00025 mica condenser.
1 .0001 mica condenser.
1 .1 Tubular condenser.
Sockets—2 Octal, one six-pin.
Terminals—one red, one black.
Speaker—5in permagnetic, matched for output valve.
Batteries—one 1.4 volt PR8, two 45 volt PR45.
Valves—1N5G, 1D8GT.
Sundries—Nuts and bolts, solder lugs, hook-up wire, three knobs and one six-pin plug.

PERFORMANCE

The set uses two valves, and is capable of operating a loud speaker on both the local and interstate stations.

It has been thoroughly tested on both the north and south of the Harbor, in districts which could not be classed as "picked" localities.

At both places the local stations were well received. In fact, at full loudspeaker strength many of the stations could be heard at quite a considerable distance from the house.

Many of the interstate stations were received at good volume, and could be classed as excellent listening entertainment. While naturally the set could not be compared to a larger electric set, we consider the results obtained from it were almost amazing.

By way of experiment, we tried the set with only 45 volts high tension, instead of the usual 90. All the local stations came in quite well, with rather less volume than with the 90 volts applied. However, this will give some idea of what can be expected from the set operated under normal conditions.

THE LAYOUT

The layout is something similar to that of Simple Simon, except that the plug-in coils have been replaced by an aerial and R.F. coil with reaction. By looking at the photograph of the top of the chassis the location of the various components can be seen. Although these are arranged quite compactly, there is definitely no cramping of the parts.

The two-gang condenser is mounted on the left side of the chassis, and the speaker on the right. Between the tuning condenser and speaker near the front edge is the aerial coil. Immediately behind and in line with this coil are the two valves, 1N5G and 1D8GT.

The R.F. coil is mounted directly behind the tuning condenser, and the audio transformer fits into the space between the back of the speaker and the back edge of the chassis.

THE CIRCUIT

As previously mentioned, the set is a two-valve battery type, using the latest 1.4 volt valves. Although others could be used in place of these, we used the 1.4 volt type mainly because of their economy.

Since the 1D8GT is actually a dual-

purpose valve, the set has the same performance of one using three ordinary valves.

The 1N5G is used as the R.F. amplifier, and is preceded by the usual tuned aerial circuit. The output from this section is fed into the 1D8GT, which is used as a detector and output value.

The triode section of the 1D8GT is used as a regenerative detector. Its output is coupled to the pentode section by means of the audio transformer. The pentode section acts as the output stage of the set.

Note that this set will only tune over the broadcast band. However, we do not think this will be any great disadvantage as the majority of people spend the greater part of their time listening to the local stations.

To have attempted to make this set a dual-wave receiver would have required a special coil kit, and introduced several other difficulties which might have marred its performance.

FILAMENT RESISTOR

It is necessary that a .25 ohm resistor be connected in series with one of the "A" battery leads.

This is used to drop the "A" battery voltage to the correct limits. Although the standard batteries are rated at 1.4 volts, they are usually in the vicinity of 1.54 to 1.60 volts when new.

Connecting the filaments straight to the batteries without a dropping resistor might considerably shorten their life. Also the maker's 90-day guarantee will be invalid if this resistor is not used.

After the battery has been in operation for some time, this resistor may be shorted out of the circuit, so that the valves will still receive their correct voltage.

REACTION

We have decided to use condenser reaction in this set, as it is simple and satisfactory in operation. It also provides us with a change from the usual variable resistor method, which we have been using lately. However, should you prefer the variable resistor control, it can be used with equal success.

The tuning gang used is a full-size two-gang type, with trimmers. These trimmers are adjusted in the usual manner to align up the set.

By using the full-size gang, we are assured of being able to cover the entire broadcast band. The capacity of this condenser is the standard capacity of .000385 mfds.

BIAS

Since the grid in the pentode section of the 1D8GT requires nine volts for bias, we used the ordinary bias battery in preference to any other source of supply.

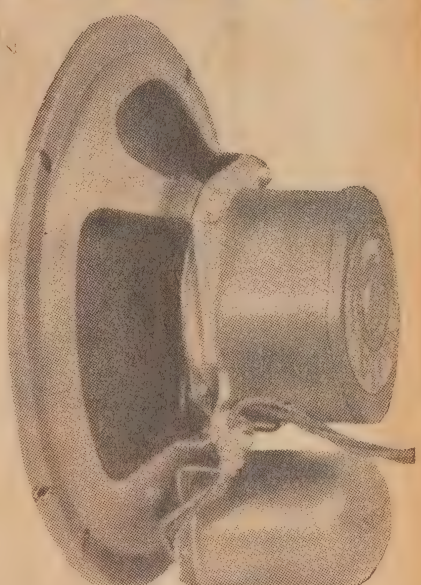
Although automatic bias could be easily fitted to the set, it means that nine volts has to be subtracted from the high tension voltage. This is not entirely desirable, as the decrease of nine volts in the "B" supply would cause an appreciable drop in the output of the set.

Consequently, by using the bias battery, we still retain the full 90 volts for high tension and the output does not suffer.

GENUINE QUALITY—
IS BUILT INTO EVERY
☆ Rola

For the "Tiny Two" battery set described in this issue, the Rola 5/4 is particularly recommended. Its high efficiency at all volume levels, richness and purity of tone, and its all time dependability make it particularly suitable for receivers employing the new 1.4 volt valves.

For your "Little General," Radio and Hobbies' latest wonder set, the Rola K5, priced at 25/-, would be your logical choice. It has all the best features of the entire Rola range of speakers.



Rola 5 and 6-inch permanent magnet models are the very speakers for your battery set. Oval magnet moulded polyfibrous diaphragm, special transformer patented dustproofing and acoustic filter all combine to give these speakers vast superiority in their group. Little wonder that the manufacturers of Australia's best battery sets have made heavy demands upon the Rola factory for supplies of these amazing little speakers.

5/4 The lightest and most compact Speaker available in Australia. Complete with detached small isocore transformer (prevents electrolysis) **26/-**

6/11 A highly efficient six-inch fully dust and sand-proof Speaker. Uses oval magnet to conserve space without sacrificing performance **35/-**

Write for Specification Sheets and Full Price List.

N.S.W. DISTRIBUTORS:—

John Martin Pty., Ltd., 116-118 Clarence St., SYDNEY.

George Brown & Co., Pty., Ltd., 267 Clarence St., SYDNEY.

ROLA COMPANY (Aust.) PTY. LTD.

The Boulevarde, Richmond, E.1 Vic. 116 Clarence St., SYDNEY, N.S.W.

AUDIO TRANSFORMER

An audio transformer is used to couple the triode and pentode sections of the 1D8GT, as it affords us the best possible gain.

The ratio of the transformer we used was 3.1, although this is not critical. If you happen to have a transformer on hand with a ratio somewhere near this value, it should be quite satisfactory.

Although it is not necessary to buy an expensive transformer, it should be remembered the better the transformer the better the performance of the set.

SPEAKER

The speaker we used was the latest 5in permanent magnet type. This was matched to the output section of the 1D8GT. Although this speaker is rather small in size, it is very efficient, and proved to be a good performer.

BATTERY CONSUMPTION

Probably the battery consumption figures will interest those who like to know just how economical this type of set is to operate.

Since the valves are the 1.4 V-type, the filament supply is a specially developed dry cell. The 1N5G draws .05 amps and the 1D8GT .1 amps, making a total of .15 amps.

The "B" battery drain is equally as economical, being eight milliamps at 90 volts.

Thus, it can be seen that one set of batteries will give many months of useful work under average operating conditions.

SPECIAL !

Next month we hope to describe a new set—the "1940 Pentagrid Four!" It will be quite the best 4-valve battery set to date, and much superior to the older sets bearing the "Pentagrid" title. To keep the price down it will cover the broadcast band only, and will have real performance and economy. Watch for it in the May issue.

THE COILS

The coils used are the standard aerial, and R.F. with reaction types, enclosed in the small square metal can. They are very easy to wire into the circuit, as the connecting lugs are plainly marked with their connection. Since many of the coils being marketed now use Trolitul as their base support, &c., they should be handled with care as regards heat.

This insulating material has an extremely low melting point, and consequently a soldering should not be held on the lugs for too long.

The quickest way to solder the wires to the lugs is to tin the wires first, and then with a hot soldering iron quickly attach them to their respective lugs.

ASSEMBLING THE PARTS

If you buy a ready-cut chassis, the parts can be easily bolted in position without any further cutting or drilling.

More Power to your portable

● When the time comes to replace the batteries in your portable set, choose the batteries selected as standard equipment by 90% of portable set manufacturers — choose *Eveready* Portable Radio Batteries. Made in Australia, and in one of the largest and most up-to-date dry cell manufacturing plants in the world, they are your best guarantee of a smooth, even flow of power and the longest possible period of serviceable life. Obtainable everywhere.

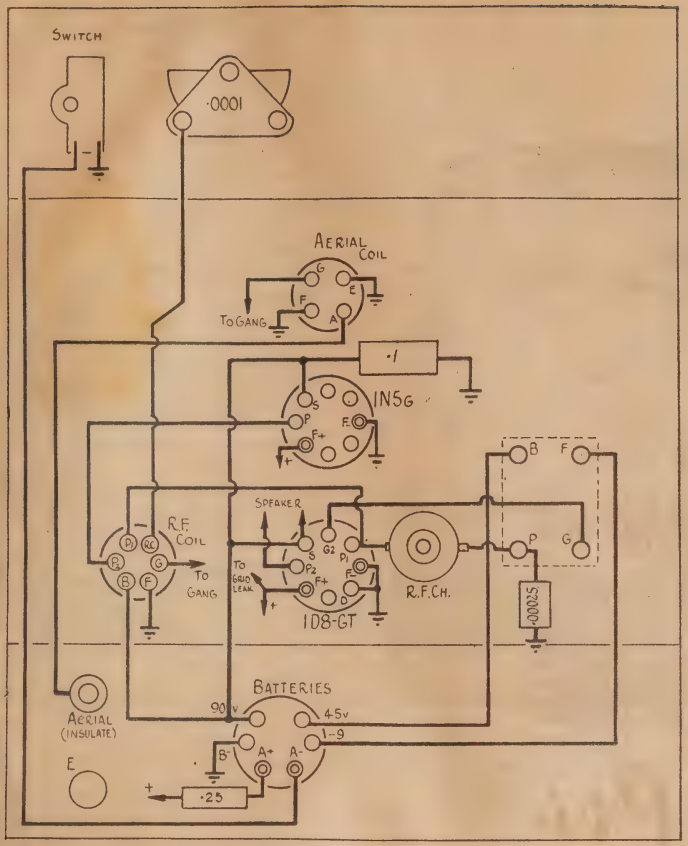
P45-1370.

EVEREADY

TRADE-MARK

RADIO BATTERIES

● EVEREADY (AUSTRALIA) PTY. LTD., SYDNEY, N.S.W.



The wiring of the set is very simple. This diagram is drawn to scale.

However, if you intend making your own chassis, we have drawn the wiring diagram to scale, and any essential measurements can be taken from this.

The valve sockets are mounted first, and care should be taken to have the small slot in the key facing the back of the chassis. This will simplify the wiring-up.

Before mounting the tuning condenser, about six inches of hook-up wire should be soldered to each of the lugs at the bottom. It is easier to do this now than when the condenser is bolted in position. The condenser is bolted flat on the chassis, and the dial is lowered to meet the condenser shaft by cutting a small piece out of the chassis front.

The aerial coil is mounted close to the front edge of the chassis, and to the right of the condenser. The R.F. coil fits in the small space between the back of the chassis and the tuning condenser.

THE WIRING

The first connections to wire in are the filament leads. Care should be taken not to forget to include the .25 ohm resistor in the "A" plus lead. If the "A" battery is connected to the leads the wiring can be tested for continuity. If the connections are O.K. the valve filaments will be seen glowing in a darkened room.

The coils should be next wired in, taking care to carefully follow the wiring code. The grid leads should be kept off the chassis and away from any plate leads.

After these have been connected up there is very little more to do. By following the wiring diagram these other few leads can be connected, and then the set is ready for testing. A good plan for the battery leads is to make them different colors, so that they will not get mixed. If the "A" battery leads happened to get mixed up with the "B" battery, the results would be a rather urgent order for two more new valves.

OPERATING THE SET

With a good aerial and earth connected, the tuning condenser should be rotated slowly until a station is picked up. The reaction control is then varied until the volume is at its maximum. Then, with a screwdriver, the trimmers on the condenser are adjusted for maximum volume. When these have been adjusted, the other local stations should be received quite easily and at good volume.

YOU'LL NEVER LOSE A CUSTOMER
...by giving him the best...
IRC
No other Resistor offers ALL these outstanding characteristics:
Accuracy, Permanence.
Absence of Noise.
High Voltage Insulation.
Complete Sealing Against Moisture
Metalised Resistance Principle.
Crack and Breakproof.
Vibration Proof.
High Frequency Performance.
Colvin Coding and Marking.
NOTE THESE PRICES
½-watt (Type BT½) 9d; 2-watt (BT-2) 2/-; 1-watt (Type BT-1) 1/-; 3-watts (F-3), 3/6.
Sole Agents for Australia:
Wm. J. McLellan & Co.
Bradbury House, 55 York St., Sydney.

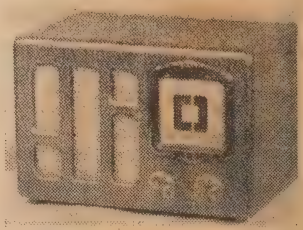
Don't Scold Your Dealer
If Your Radio Parts Don't Fit
— When you can buy
JONMAR KITSETS

for the

"LITTLE GENERAL"

and

"TINY TWO"



Little General—as completely assembled.

Only matched components as used by "Radio and Hobbies" are used in Jonmar Kitsets. Entirely complete, including wire, screws, nuts and bolts, solder, etc., Jonmar Kitsets save you time, money and disappointments—and you are SURE of always getting the best results! JONMAR KITSETS never let you down! Write for prices and detailed parts lists.

TELEGRAMS: "JONMAR," SYDNEY. TELEPHONE: BW3109 (2 LINES).

JOHN MARTIN PTY LTD — RADIO & ELECTRICAL SUPPLIES

116-118 Clarence St., Sydney.

Rola

Incorporating the most advanced features in loud speaker construction, "The World's Finest Sound Reproducers" are ideal for high quality receivers and amplifiers.

"LITTLE GENERAL"

K5—5 inch electro 25/-
F5B—6¾ inch electro 28/6

FOR THE "TINY TWO"

5/4—5 inch permag 26/-
5/8—5 inch permag 31/-

Write to "The Friendly Wholesale House" for everything radio and electrical at the Lowest Prices in the State!

"50,000,000 FRENCHMEN CAN'T BE WRONG"—So sang the Great War Song!

They can't be wrong when they choose their word *Satisfaire*, to mean

SATISFACTION!

Australian Servicemen and Home Constructors purchased over

50,000 "CROWN RADIO" TUNING COILS AND I.F. TRANSFORMERS IN 1939!

THEY WERE SATISFIED!!

If YOU use—"CROWN RADIO PRODUCTS"—YOU will be satisfied.

TUNING UNITS, TUNING COILS, and DIALS to MATCH. I.F. Transformers, Voltage Dividers, W.W. Resitsors, Trimming and Padding Condensers. ("Australian" Ceramic Bases).

Our satisfaction rests with your satisfaction. "True to label" products only will satisfy.

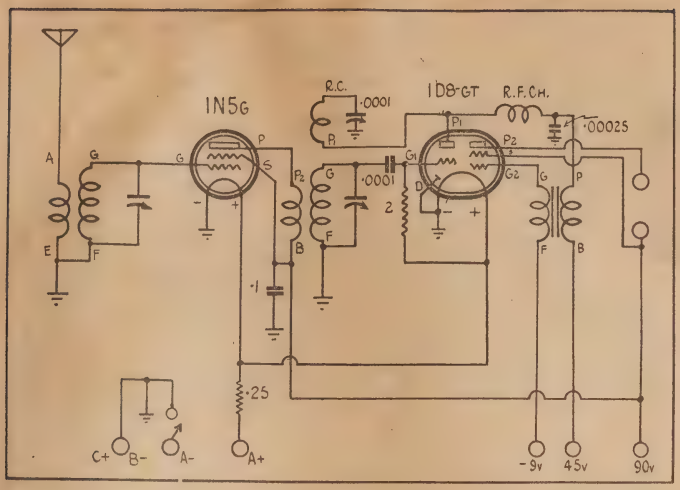
For full information enquire from your AUTHORISED DISTRIBUTORS.

Bloch & Gerber Ltd., 46 York Street, Sydney.
Martin de Launay Pty. Ltd., 289 Clarence St., Sydney.
John Martin Pty. Ltd., 116 Clarence St., Sydney.
Lawrence & Hanson Elec. Pty. Ltd., 33 York St., Sydney.

AND THEY WILL GIVE YOU SATISFACTION.

CROWN RADIO PRODUCTS Pty. Ltd.

51-53 MURRAY STREET, PYRMONT, N.S.W. 'PHONE: MW2628 (3 lines).



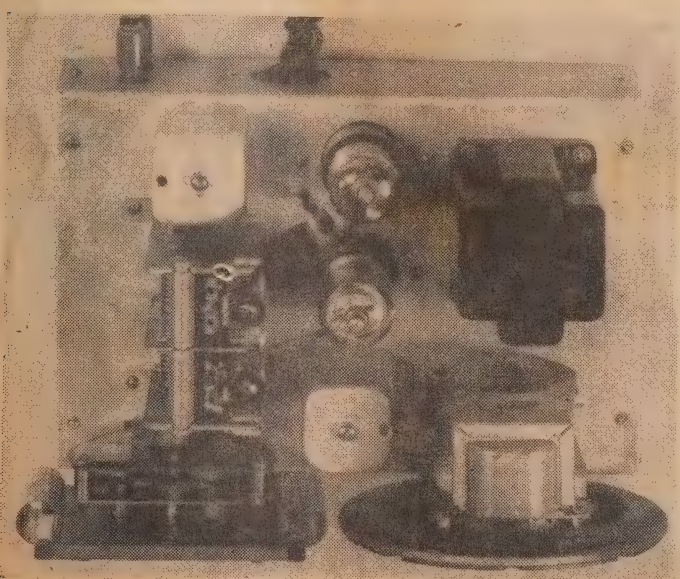
The circuit is very similar to the Duplex Single for 1939, except that the R.F. stage has been added to give better performance. It makes an ideal "first set."

SPECIAL NOTE

We would like to say here something about the matter of selecting the right receiver for the right purpose. Lately we have been receiving a number of letters which indicate that some people who build our sets do so without a clear idea in their minds just what to expect.

This refers specially to battery sets. It is only natural, because the owner of a battery set generally is some distance from the major broadcast stations, and, obviously, if he has a set not large enough for his purpose, he is in trouble.

These little one and two valve sets can do wonders, but they cannot work miracles. Therefore, if you are a hundred miles or so from the nearest station, don't depend on this receiver to give you full speaker strength in daylight. You need a set with considerable gain to do a job of this type.



This plan view shows how the above-base connections are made. Note the grid leak, which is connected to A-plus by means of a lead, which runs under the chassis.

GOOD COMPANY

LIGHTENS THE TASK
WHEN RADIO
TAKES A HAND.

Radio brings to your home the joyous music and constant companionship that lightens all duties and provides more leisure hours.

★ ★ ★

A second set banishes loneliness, widens knowledge and creates that happy atmosphere which is so conducive to good health.

★ ★ ★

For constant reliability be sure that the second set you choose is equipped with

RADIOTRON VALVES
★ SEALED FOR YOUR PROTECTION

Advt. of Amalgamated Wireless Valve Co. Pty. Ltd.

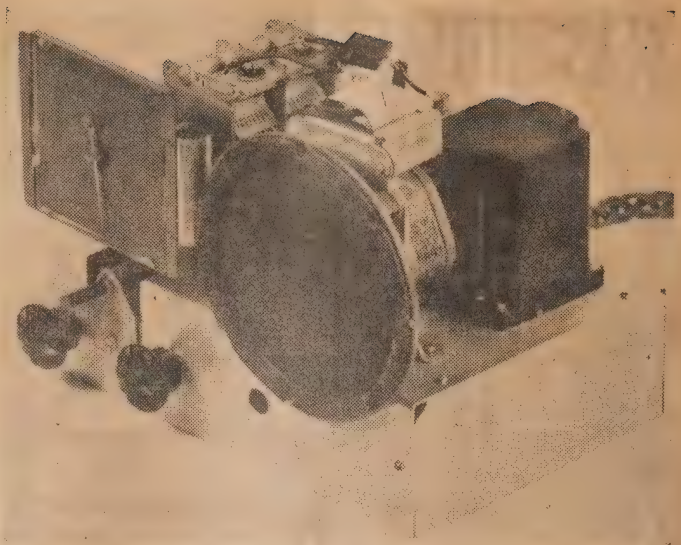
It is impossible to forecast what to expect in country areas, as there are so many variables to be taken into account.

For instance, we know that one man in one spot will be able to get good reception over incredible distances on a baby receiver. We have letters to demonstrate this, in which claims are made that cause our hair to stand on end.

And yet others will write to us, indicating that their geographical position is such that even a good distance-getter cannot give the results we know that it should.

The point of all this, therefore, is that unless you know there are one or two stations which put strong signals into your locality, don't built up the Tiny-Two as a standard receiver. It was never intended to pull in stations from all over the place, and pump out a big noise from the speaker. On the other hand, it is quite possible you will get strong signals from stations many miles away, if your locality is favorable.

We can imagine many little homesteads within twenty odd miles of a country station finding the Tiny-Two a marvellous proposition because of its very low cost, light running expenses, and adequate performance. We can imagine many lads who don't want the expense of an electric set, finding the Tiny-Two just what they have been looking for, with which to learn something about radio.



Another view of the set showing further details.

But we don't want you to make the set if you have to rely on programmes a hundred miles away for your everyday fare. We can't consider what you **might** get, we have to think of what, all things being equal, you **should** get.

We would be glad to hear from our readers on this very point—the range of their sets, big and small, in different parts of Australia. It would help us quite a bit in advising others, and to publish reception reports as a guide. We

FOXRADIO

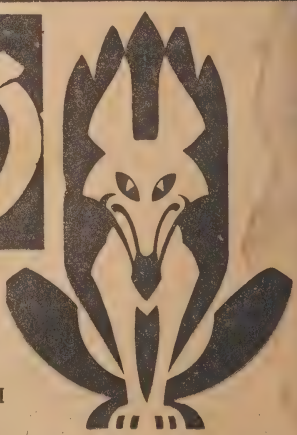
PRESENTS

THIS REMARKABLE MORSE CODE SET

comprising

- P.M.G. PATTERN KEY
- SPECIAL HIGH PITCH SOUNDER
- EVER-READY 4½v. BATTERY
- Complete copy of Morse Code Including Abbr. and Numerals

17/6 PER KIT POST FREE



We Specialise in R. & H. Kits.

Write for Special Price Kits of Parts for R. & H. Circuits featured in this or previous issues.

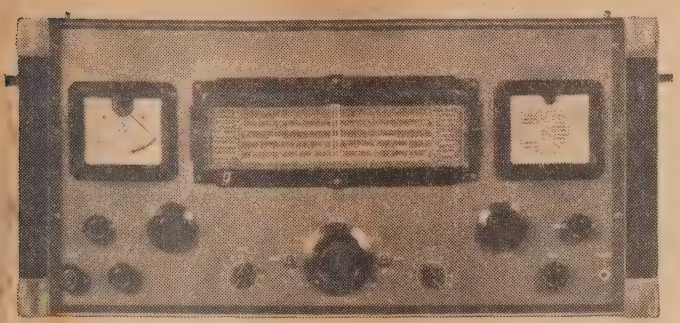
FOX & MacGILLYCUDDY Ltd.

MERINO HOUSE, 57 YORK ST., SYDNEY (in Liq.)

Tel. B2409. Telegram: Foxradio.

SENSATIONAL NEW SKY-RAIDER RECEIVER

We have just inspected the new Sky-Raider special 12-valve communications receiver, made and sold by Craven-Wylde. It is quite the most elaborate and impressive set of its kind we have ever seen in Australia.



Here is a view of the front panel. A specially designed tuning dial is used with a band-spread pointer in addition to the main calibrations.

THE word "Communications" has been stretched to include almost every type of receiver, large and small. This set deserves the name, because, with a carefully calibrated range from 33.3mc. to 540kc. it covers just about every communications channel in existence below and including the broadcasting band.

Its finish is most impressive. A handsome black crackle steel case, a new bandspread dial, with a separate pointer for each job, easy and simple control, and fine performance are features worth talking about.

Our photographs give some idea of the set's general appearance. Note especially the coil assembly, which has been specially designed for the requirements of this super-set. The coils are trimmed with air-condensers, and are enclosed in a heavy cast aluminium case.

Here is a full list of specifications:—

Cabinet.—Black crystalline steel, with chromium plated fittings. Front panel of nickel-plated steel with lustre black baked enamel finish. Engraved control calibrations.

Chassis.—Special 16-gauge heavily Cadmium-plated steel, reinforced and braced for rigidity.

Controls.—Band set, band spread, wave change, R.F. gain, audio gain, B.F.O. on off, B.F.O. pitch, H.T. on off, mains on off, A.V.C. on off, noise silencer, tone control, phone jack.

Coverage.—First band: 33.3mc. to 12mc. Second band: 19mc. to 7.6mc. Third band: 8mc. to 3.4mc. Fourth band: 3.9mc. to 1.38mc. Fifth band: 1.42mc. to .54mc.

Dial.—Dual scales (band set and band spread) incorporated in large straight line dial. Weighted drives, hairline pointers. Precision calibrated in megacycles.

Band Spread.—Separate condenser, giving complete band spread at any portion of the main tuning range.

Valves.—6K7, R.F. amplifier. 6K8, 1st detector and oscillator. 6U7G, 1st I.F. amplifier, 455kc. 6L7, 2nd I.F. amplifier, 455kc. 6H6, 2nd detector and A.V.C. 6L7G, 1st audio amplifier. 6L6G, beam power output. 6C5G, signal meter tube. 6C5G, beat frequency oscillator. 6L7, noise amp. 6H6, noise rectifier. 5X4G, rectifier.

Insulation. — Ceramic or Trolitol throughout.

Band Change.—A sliding coil box of cast aluminium is mounted on silver steel rods under the chassis, the driving mechanism being controlled by a knob on the front panel. All coils with their air dielectric trimmers are mounted in individual compartments in the box. This system gives all the advantages of a plug-in-coil system by simply turning a knob.

Noise Level.—8 per cent. to 12 per cent

Sensitivity.—Better than 1 microvolt.

Selectivity.—15kc. to 1000kc.

Noise Silencer.—New improved Lamb type. Semi-automatic.

Signal Meter.—Directly calibrated O-R Max.

Phones.—Output is limited so that blasting is avoided even when controls are all turned to maximum.

Pickup.—Terminals and switch provided at rear of chassis.

Speaker. — Special 12in. Magnavox mounted in separate floor cabinet.

As you will realise, we have no termed it a remarkable set for nothing.

So far we have not been able to give it a careful air test. However, we hope before our next issue goes to press to have one available for testing. The results will be related next month.

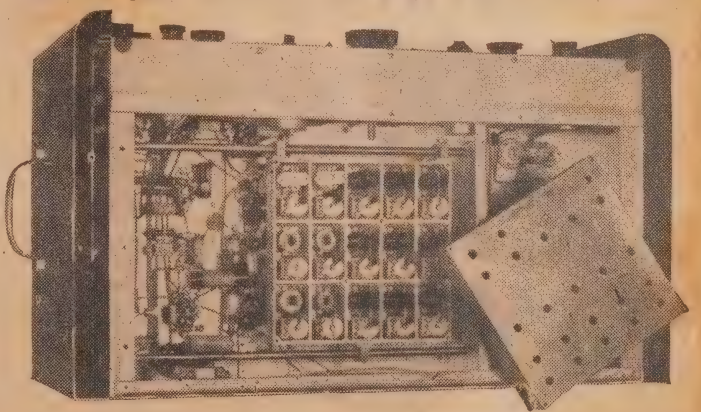
LEVENSON'S FACTORY BUSY

MAKING record numbers of Morse Code sets, Buzzers, &c., Levenson's factory is breaking all production records. Many of these lines are for Navy and Army use, but are available also to wholesalers and retailers.

Another big seller at Levenson's is the new Cosmocord Crystal Pick-up, which sells at the reduced price of 48s 6d.

None of Levenson's huge stock of radio goods and novelties has been increased in price. There is no profiteering when you buy from the popular Pitt-street store.

In addition to radio lines, Levenson's carry big stocks of tricks and novelties. A large illustrated catalogue is available. Many of its items are included in the advertisement on the inside back cover of this issue.



A picture of the coil assembly. Note the collection of air-dielectric trimming condensers, one for each coil.

COOKE'S ELECTRIC GUITARS

From reports received from Cooke Bros., Pty., Ltd., of 483 Kent Street, Sydney, it is apparent that the electric amplifying guitar is one of the most popular playing instruments now in demand. During the past few months the demand for this instrument has been exceptional which is probably due to its ease of operation and true reproduction qualities.

THE "Maxitone" amplifying guitar which is marketed by this firm is beautifully finished and moulded in ebony, with nickel-plated magnets, hand rests, &c., and comes complete in a specially-shaped carrying case. Both the high and low output units have been constructed to withstand vibration and sudden changes of temperature, while special non-corroding materials are used in all parts likely to be affected by climatic conditions.

The amplifying unit is contained in a separate carrying case, together with a canvas waterproof cover. A 6L6G valve is used with inverse feed-back and a special preamplifier circuit, which ensures trouble-free operation and is capable of an output of 6.5 watts undistorted.

A 12-inch dynamic speaker is used with this unit and is placed in a small portable cabinet. This cabinet has a ¾-inch baffle board and has been designed to give a resonant, free reproduction.

The weight of the complete unit in cabinet is exceptionally light for an amplifier having such high quality characteristics, and anyone interested would do well to inspect the range at Cooke Bros.

A complete electric guitar outfit supplied by Cooke Bros. It includes the instrument itself, amplifier, carrying case, and loud speaker unit. Special care has been taken to keep the weight down to a minimum.

NEW DIAL RELEASE FROM R.C.S.

AMONG the trade releases for this month are two new dials by R.C.S., Radio Pty. Ltd. These are known as the type DA1 and DA2, and both are calibrated for dual-wave use.

These dials were produced in answer to many requests for simple type of dial that would track accurately with R.C.S. coils. Now, by using one of these dials with the correct combination of tuning condenser and coil unit, the stations can be received in their exact position on the dial.

The DA1 is a single glass dual-wave dial intended to be used with R.C.S. coils and a "F" type tuning condenser. The DA2 is a special dial for use in communications type receivers with the special five-band coil unit and a "H" type tuning gang.

Further particulars can be obtained from R.C.S. Radio Pty. Ltd., 50 Glebe-street, Glebe, who will welcome any inquiries. Also, the new price list issued by this firm is now available from either the above address or any dealer.

FOR YOUR PARTY!

Mick Simmons' Novelties

MICK SIMMONS, of Haymarket, Sydney, are continually adding to their stock of tricks and novelties—just the things for your next party. Large or small, there are hundreds to choose from.

For instance, there is the "Ball through glass trick." To pass a red ball through a solid sheet of glass seems an impossible task to the audience, but for the performer, it is easy.

And yet, when this trick is done, the audience is none the wiser after inspecting the components you have used. Mysterious is the word!

Another novelty, or novelties, are known as the "Snooty Pups." If placed near to each other, they just won't stay put. Any smooth surface will do, and there is no mechanism to break.

★ ★ ★

IMPS MAGIC CLUB

AT Mick Simmons, those interested in magic may become a member of the IMPS (Independent Magical Performers of Sydney). This is a club that meets so that members can discuss and compare acts, tricks, &c. Membership is free and the IMPS have an elaborate theatrette for their sole use at Mick Simmons, Ltd. A stage, seating, footlights, in fact everything necessary is provided for the "putting over" of shows, &c.

The IMPS magazine is published monthly and sells at 6d per copy. In it you will find tricks, information, advice and stories by well-known local magicians. For further information, visit the Magical Department, at Mick Simmons, Ltd., "The Magicians' Paradise" at Haymarket, Sydney.

POPULAR E.T.C. MICROPHONES UTILISED FOR SOUND SYSTEMS

IT is announced by E.T.C. Industries, Ltd., that advice has been received from Long and Shorter Sound Engineers, Sydney, concerning the amplifying systems used at the Sydney Showground for the recent Police Carnival. These incorporated three well-known E.T.C. microphones. The DN, US, and T3 types were used, and no doubt some of the credit for the excellent amplification must go to them.

The same equipment and microphones will be used for the forthcoming Military Tattoo, which is also to be held at the Showground on April 25. The sound system for the speedway races at Bathurst on Easter Saturday and Monday, and which will be installed by the same sound engineering company will utilise two Astatic DN microphones.

Leaflets fully describing these popular microphones are available on request from E.T.C. Industries, Ltd., 470-480 Elizabeth-street, Sydney.

RADIO EQUIPMENT PORTABLE

HAS FINE PERFORMANCE

A four-valve portable set with the performance of a five, has been released by Radio Equipment. The most remarkable feature of the set is the fact that two intermediate stages are employed.

ALREADY the name of Radio Equipment Pty. Ltd. has become well-known in the radio trade for the excellent quality of its products. This latest release is no exception. It is a four-valve portable receiver using the latest 1.4 volt valves, and is one of the neatest built portable sets we have seen for some time.

A handsome and serviceable cabinet is used for the receiver. A compartment at the side allows access to a socket for connecting a set of larger batteries when the receiver is used for service in the home.

Incidentally, this set will be known in the trade as the PK4 1.4-volt Portable Receiver. This particular model was tested in our own office, and the results were excellent. All the local stations were received with full volume, while 2KA, Katoomba, was received quite well. Such performance in broad daylight and in a steel building speaks well for the possibilities of the set operated under good conditions.

In action on the dining-room table the receiver lived up to its promise. The dial was literally filled with stations strong and weak, from near and far. The tone of the receiver is particularly noteworthy—we notice a small hole in the back, which acts as a release for the air inside—a wise precaution for obtaining good results at anything above average volume.

Incidentally, there is a small door at the side which allows access to a battery socket. Into this socket may be plugged a set of full-sized batteries when the set is operated in the home.

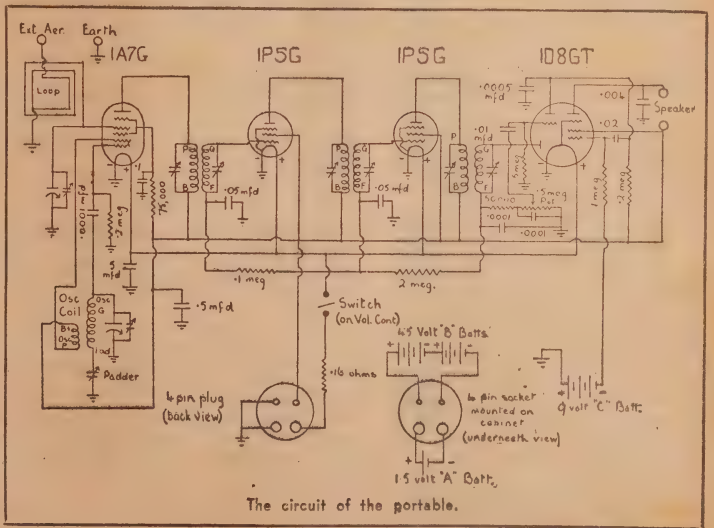
The circuit is very efficient, with good selectivity and sensitivity. This is brought about by using two stages of I.F. amplification in conjunction with a high "Q" loop aerial wound at the back of the cabinet.

Although only four valves are used, the set is equally equivalent to a five-valve set. The output from the set is fed into a very efficient 6½-inch permanent magnet speaker.

Many other modern features are incorporated in this receiver, including A.V.C. This is applied to the two I.F. stages and ensures uniform output strength, regardless of the strength of the signals received from the broadcasting station.

The appearance of the receiver is very attractive, due to the aeroplane cloth covered cabinet and large dial, which is clearly marked with both local and interstate stations.

This set is now available in either kit form or ready built for use. Radio Equipment would welcome any further inquiries from those interested in this type of set.

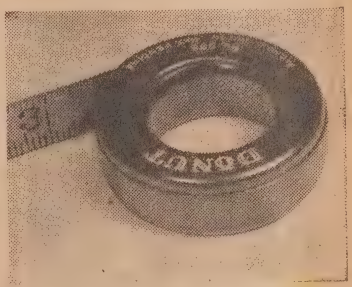


The circuit of the portable.

NEW STEEL TAPE RULE

SINCE every radio mechanic and hobbyist requires some type of rule the new medium priced tape rule being sold by Nock and Kirby Ltd. will be sure to interest many.

The blade is of bright steel with the prominent dark lines and figures in sharp contrast, making it very easy to read. The blade is concave shape to hold it stiff for straight measurements, and yet allowing it to flex easy for circular measurements.

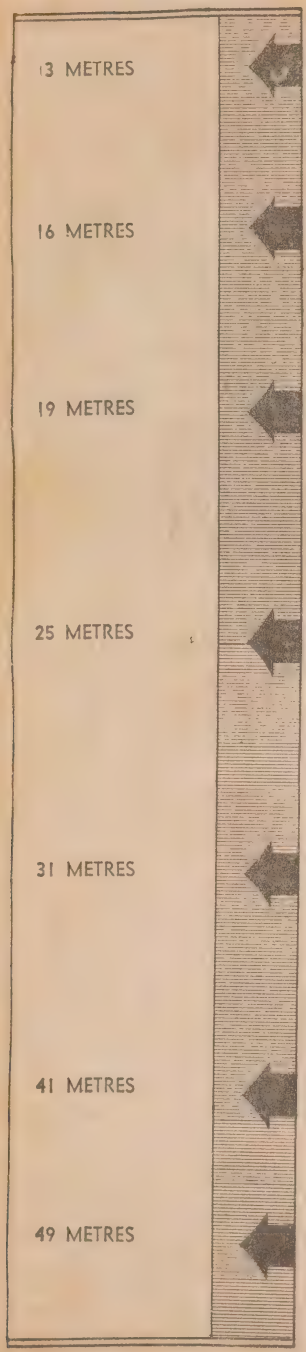


The blade is manually withdrawn and returned to the case, and, owing to its balanced construction, operates quite smoothly. It will remain set at any length and not spring back into the case.

The first end of the tape has a small metal hook attached which makes it very handy for measuring beyond the arm's reach. The tape is contained in a sturdy metal black finished case, which fully encloses the blade and excludes dirt.

Anyone desiring to buy a steel tape type of rule would do well to see this article before buying.

S. W. TUNING CHART



13 METRES

GSJ 13.93m Daventry. 8.40 p.m. onwards.

16 METRES

GSG 16.86m. Daventry. 8.40 p.m. onwards.
DJH 16.82m. Berlin. 7.0 p.m. onwards.
TPB3 16.88m. Paris. 8.0 p.m. onwards.
2RO8 16.84m. Rome. 8.0 p.m. onwards.
WNBI 16.87m. New York. Good 11.0 a.m. and weak at 11.0 p.m.

19 METRES

GSF 19.82m. Daventry. Excellent at 9.0 p.m.
DJR 19.56m. Berlin. Good at 9.0 p.m.
2RO6 19.61m. Rome. Good in morning at 7.0 a.m.
CSW4 19.71m. Lisbon. Very good at 2.0 a.m.

25 METRES

GSD 25.53m. Daventry. 4.0 p.m. till 8.0 p.m.
DJP 25.3m. Berlin. Excellent at 7.0 a.m.
TPC8 25.33m. Paris. Excellent at 7.0 a.m.
2RO4 25.4 Rome. Very good at 6.0 p.m.
JZJ 25.42m. Tokio. 6.0 to 7.0 a.m. good, also 10.30 p.m.
Radio Saigon. 25.47m. Saigon. 8.45 p.m. very good.
WRUL 25.45m. Boston. Good at 7.0 a.m.
CB1180 25.12m. Santiago. Very good opening at 9.30 p.m.
RNE 25.0m. Moscow. Very good at 9.0 p.m.

31 METRES

GSB 31.55m. Daventry. Good at 6.30 a.m. and 6 p.m.
GSC 31.32m. Daventry. Good opening at 6.50 a.m.
GRX 30.96m. Daventry. Very good opening at 11.30 p.m.
DJW 31.09m. Berlin. Very good at 5.0 p.m.
XEWW 31.57m. Mexico City. Very good Sundays at 4.0 p.m.
HJFK 30.83m. Pereira, Colombia. Good opening 10 p.m.
2RO9 31.03m. Rome. Very good at 7.0 a.m.
WGEO 31.48m. Schenectady. Very good at 7.0 a.m.
KZRH 31.15m. Manila. Excellent every night from 8.0 p.m.

41 METRES

JVW 41.34m. Tokio. Excellent between 6.0 and 7.0 a.m.
GSW 41.49 Daventry. Fair at 6.0 a.m.
JIE 41.13m. Tyureki. Good at 12.30 a.m.

49 METRES

GSA 49.56m. Daventry. Good at 3.0 a.m. also at 5.0 p.m.
KZEG 48.86m. Manila. Good from 8.0 p.m.
RV96 49.75m. Moscow. Excellent at midnight.
ZHJ 49.18m. Penang. Good at 11 p.m.
DJC 49.83m. Berlin. Fair at 6.30 a.m.

OVERSEAS BROADCASTS

ENGLAND.—A welcome addition to the Empire stations has been the session from GRX, which starts at 11.30 p.m. when it is heard at very good strength. Some really interesting items have been heard from Daventry this last month, one of the best being the description of the new liner leaving the Clyde, and also an eye-witness account of its arrival in New York. We also notice some of the old pre-war sessions have been reinstated, which will, we are sure, please many of our readers.

ITALY.—The Italian stations are now being very well received both in the early mornings on the 31-metre band, and also on 25-metre stations at night, plus on favorable nights the 16-metre band station, 2RO8.

SPAIN.—After not being heard for some considerable time, we have recently heard the old EAQ in Madrid back on the air again around breakfast time. Strength is not as good as before, but perhaps with the improvement in daylight reception which is now so marked, it may improve in strength. In addition to EAQ, there is also "Radio Malaga" on the 41-metre band, which is heard fairly well in the early morning. The many wartime stations which were all heard so well on this band seem to have left the air.

ECUADOR.—The well-known station HCJB, in Quito, is now being heard at quite good strength at night, though the session appears to be entirely Spanish. A few months ago a very interesting English session was heard from this station every night.

CUBA.—On Sunday afternoon during the past month a great improvement has been noticed in the many Cuban stations in the vicinity of 33 metres. COCX, COBC, COCH, and one or two others come in nicely till late in the afternoon, while at night COCO has an evangelistic church service commencing at 10.30 p.m. This latter programme is heard at very good strength, when all items are given in English.

FRANCE.—Our French Allies are always well to the fore with their programmes, and fortunately for those of us who are not conversant with their language, many announcements are now given in English. What is probably one of the loudest of them is TPC8 on 25.33 m., who comes in at terrific strength every morning around 7 a.m.

PHILIPPINE ISLANDS.—Station KZIB in Manila has advised one of our readers, Mr. R. K. Clack, that they expect to increase the power of their 31-metre band station some time in April, and also to move into a new building with larger and more modern studios. Their 49-metre band outlet is only intended to reach the distant provinces in the Philippines, while the one on 9500kc. is intended for overseas reception.

RAY SIMPSON'S PAGES

The MONTH on SHORT-WAVES

25 and 31 Metre Bands Provide Excellent Reception

As Autumn approaches we find daylight reception gradually improving on the 25 and 31 metre bands, providing an opportunity of hearing a few stations which have been inaudible previously except during the hours of darkness.

AS the weeks go on the 13, 16 and 19 metre bands will become less reliable in their night sessions, though they usually stage a come-back for a few nights before disappearing.

CHANGES IN WAVELENGTH

Quite possibly before these notes are read by some of our distant readers various changes will have been made in the frequencies used by some of the better-known stations, such as Daventry and Paris, in order that reception may be improved in the areas to which their beams are directed. Readers will therefore understand if they hear some of these stations at different times to those shown in this issue.

DX CONTEST

According to our mail last month, quite a number of our readers will be competitors in this contest. Some listeners have expressed a doubt as to their ability in tuning in some of the Central and South Americans, or more correctly we should say understanding them.

This should, however, be no deterrent, as by consulting the "Listen for These" pages they can see the best time to hear them, and by noting their sequence on the dial in relation to better-known stations, their identification should be reasonably easy.

The only Spanish known by the writer is that which he has picked up in the course of listening to the Spanish-speaking stations, which proves that the identification of these stations should be possible by any listener, providing, of course, his receiver is reasonably efficient.

Many points will, of course, be easily obtained by verifications from the U.S.A. stations, and a tip in this regard is, get reports out to these stations on the 16 and 19 metre band before they fade out for the season. After the Americans there are all the Cubans which are comparatively easy, then stations such as TIPG, TGWA, HP5J, OAX4J, and the one or two Chilean stations. No matter how few verifications you receive, send in your list when the time comes, as perhaps no one else has done any better than you have.

SPLENDID REPORTS

We are very gratified at the response to our requests for reception reports from our listeners, and we trust all those who have previously written will continue to do so in order that the "Listen for These" pages can be kept complete. Reports for next month's issue should reach the writer by April 8 to ensure their acknowledgement in the following issue. Until next issue, good listening to all our readers, and may the verifications come rolling in.

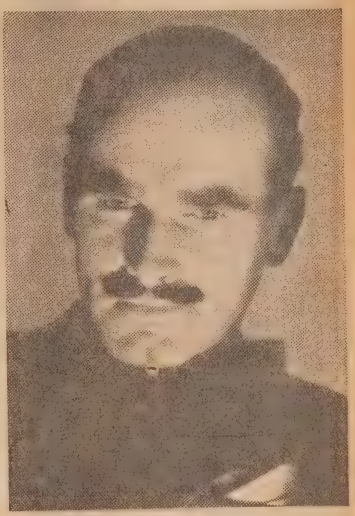
Proposed New Chinese Stations

THERE appears to be great activity among the Chinese short-wave stations, and we now learn that in the near future two new stations will be opened in Hangkow and Shanghai. The one in Hangkow will use the call-letters, XGSA, and operate on the following frequencies, 6105kc., 9520kc., 11,730kc., 15,240kc., 17,555kc., and 21,500kc.

The Shanghai station will be known as XGSB and will use 6095kc., 9505kc., 11,875kc., 15,190kc., 17,785kc., and 21,450kc. The power of both these stations will be 20kw., so should be well heard in this country if not interfered with by stations on nearby frequencies operating at the same time.

In addition to the stations mentioned above there are four other Shanghai stations who will also use the short-wave channels in the near future. These stations will also be powerful ones, using 18.5kw. Calls and frequencies of these Shanghai stations will be XGBA, 21,550kc., XGBB, 17,795kc., XGBC, 11,800kc., and XGBD on 9579kc. We are indebted to Mr. B. W. Battis, of Coraki, for the above interesting information.

AUSTRALIAN S.W. ANNOUNCER



Mr. John Royle, chief announcer of Australia's voice on short-waves.

FRENCH PUZZLE CALL

THE call letters of the many French short-wave stations have always been more or less a problem, ever since the days when there was only one transmitter on the 25-metre band, which was then commonly, but erroneously, known as FYA.

In recent years we have become used to the TPA and TPB calls, and now we have the TPC series to further confuse us. In our last letter from Paris Mondial we noticed that the station on 11,718kc. was listed at TPB7 instead of old call TPA4, while the transmitter on 11,885kc. is now given as TPA4.

THREE TRANSMITTERS

It appears that there are now three transmitters which are as follows:—TPA at Pontoise using 12kw., TPB at Essarts-le-Roi with 25kw., and now the new one, TPC, at Allouis, which has a power of 100kw.

It would seem that all the frequencies are shared by the three transmitters, which means it depends what time session you are listening to to determine what the call sign is.

For example, 11,885kc. can be either TPA3 or TPB7, and possibly a TPC call as well. Additional calls not shown previously are TPB4 on 15,295 kc. and TPB25 on 7280kc.

Probably as time goes on we will eventually get all these call letters sorted out, providing they do not change them too frequently.

BAHAMAS AND BULGARIA STATIONS

Denmark — Ecuador — Dominican Republic

The past month has been an excellent one for the reception of new stations, some of which have been unusually interesting. One or two appear to be entirely new stations while others are stations that have not been previously reported.

BRITISH WEST INDIAN STATION

ON two successive days during the past month we were very surprised to hear a station on 6090kc., 49.25m., closing down at 1 p.m., with God Save the King, and then at 11 p.m. on the same days we heard it opening when we were fortunate to hear the call-letters ZNS given. This is, of course, the Bahamas station, located in the capital, Nassau, on the island of New Providence. When heard at night this station was interfered with by ZHJ in Penang, which is slightly lower in wave-length. The daylight reception at 1 p.m. was most unusual, as it was the only station audible on the band at the time. We have sent a report by air mail in an endeavor to get a verification in time for next month's issue.

"RADIO SOFIA"

Another entirely new station is Radio Sofia, which we have heard on two week-ends on a frequency of 10,310kc., 29.09m. This station is only heard on Sunday afternoons from around 4 p.m. and also on Monday mornings till 7 a.m. On Sunday afternoon the call, Radio Sofia, is given at 4 p.m., followed by news in what we presume to be Bulgarian. At conclusion of news, one chime is given. Just before 5 p.m., an interval signal of seven notes on a piano is given until church service begins at a few minutes after that hour. Both lady and gentleman announcers give call quite frequently. This should be an easy one to log.

OZU, DENMARK

Another outlet of the many Skamlebaek transmitters may now be heard every morning on 7260kc., 41.32m., but it is not until JVW on 7257kc. closes at 7 a.m. that OZU can be tuned in with any clarity. This station opens at 5 a.m., when it is much stronger, but still mixed up with the Japanese who opens at the same time. News is given from 7 a.m. until about 7.20 a.m., followed by musical selections.

HCETC (Ecuador)

For the last three or four weeks we have been hearing a Spanish-speaking station opening every night around 10 p.m. on 9355kc., 32.05m., and we have just identified it as HCETC, "Radio Teatro Bolivar," in Quito, Ecuador. They are on the air with a news session in Spanish interspersed with musical selections, and close down at 10.45 p.m. No English is used, but the call-letters are given on opening and immediately after each musical number, followed by the slogan, Teatro Bolivar. When one knows the call they should have no difficulty in identifying this station, as it is just slightly higher in wave-length than COBC, and between that station and where OAX4J comes in. In due course we hope to give further details from their verification.

Dom. Republic and Sumatra

Another two stations heard for the first time are HI2G, on 9295kc., 32.28m., in Trujillo City, Dominican Republic. It is usually heard best in the mornings between 6 and 7 o'clock, but not always on the air. However, it can always be heard weakly at night opening at 10.10 o'clock. Look for this one on exactly the same dial setting as for XTC in Shanghai, which opens every night at 11 o'clock. Only Spanish is heard from this West Indian station.

Almost every night now another Sumatra station can be tuned in on 10,425kc., 28.77m., between about 10.30 p.m. and 11 p.m. This one is YBG in Medan, and is usually only heard in telegraphic traffic when they call Bandoeng and other centres in the Dutch East Indies. This station verifies. Address is Ir. P. C. Arends, Engineer, Java Radio Stations, Bandoeng, D.E.I.

EXPEDITION STATION FROM SOUTH SEAS

There is always something fascinating in tuning-in a short-wave station which is being operated from some remote part of the globe not usually heard in the ordinary course of listening.

It is therefore with great interest that we learn from the IDA that an expedition will shortly leave New York for a cruise extending over two years. It will be known as the Fahnestock South Sea Expedition, and will be aboard the schooner Director II. The purpose of the expedition will be to record native music, collect bird groups for the American Museum of Natural History, and also to make oceanographic studies for the U.S. Navy.

The chief point of interest to short-wave listeners is the fact that the schooner will be equipped with a 1kw. transmitter, which will be used to keep in touch with the U.S.A., and also to give a series of 20 broadcasts to the National Broadcasting Company from various out-of-the-way spots. The experimental frequencies to be used are as follows:—4797kc., 6425kc., 9135kc., 12,862 kc., 17,310kc., and 23,100kc.

The director of the expedition will be Bruce Fahnestock, while the skipper of the schooner will be Sheridan Fahnestock. Providing favorable weather is encountered, they expect to be in the vicinity of Fiji by next July. Listeners should therefore keep a look-out for this roving broadcaster.

BROADCASTING STATION FROM CHILE

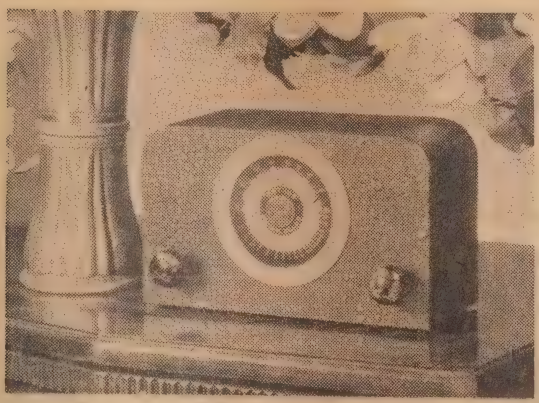
The short-wave station at Santiago—call signs CB-57 and CB-1180.

THIS SENSATIONAL

SKY PAL

MAGIC UNIT

improves overseas reception from 60% to 80%



WEAK UNIDENTIFIED STATIONS COME IN STRONGLY AND CLEARLY!

Without a doubt this SKY PAL magic unit is the best "PAL" one could possibly wish for! It is an absolute necessity in identifying weak and previously unheard stations! It vastly improves the reception from stations like London and Berlin, removing background noise entirely! If you have an ordinary dual wave set you will get the surprise of your life if you try a SKY PAL! Even if your set be a multi-valve type, and you believe your short wave reception to be good, you'll find that a demonstration will immediately change your ideas! The new SKY PAL tunes to 9 metres and is suitable for domestic and professional sets alike. No coils to change, no connection to to power point necessary! Free demonstration without the slightest obligation!

NOW AVAILABLE!

SKY-RAIDER 12

COMMUNICATIONS RECEIVER

This SUPER DE LUXE model is the latest addition to the SKY RAIDER range of communications receivers. Its design and production has been inspired by the great success which followed the release of the Sky Raider DX9 which has proved so popular with "Hams," broadcast stations, and leading newspapers. The new Sky Raider will be gladly demonstrated to any keen radio enthusiast who would wish to hear its fine performance. Write or call for full particulars.

'PHONE BW4038

CRAVEN, WYLDE

PTY. LTD.

Manufacturers & Sole Distributors Sky-Raider Radios.

10 BARRACK ST., SYDNEY (RIGHT NEXT DOOR TO LOTTERY OFFICE)

FLASHES FROM EVERYWHERE

TAHITI

The short-wave station in Papeete operated by the Radio Club Oceanin, which has been heard very well in the U.S.A., is now operating from 2 p.m. till 3 p.m. on Wednesdays and Saturdays, and under favorable conditions may be heard in this country. Although a famed (or infamed) non-verifying station, we have heard from a friend overseas that they will now verify reports.

GUADELOUPE

Another French colonial short-wave station, FG8AH, also on the 40-metre band on 7445kc., is now giving English announcements in their session between 12.30 a.m. and 2 a.m. Their identifying tune is the well-known French march, "Marche Lorraine" (Globe Circler).

ITALY

The well-known Italian station, 2RO3, in the 31-metre band, is now giving a news service in English around 4.35 p.m. We wonder whether these additional English sessions have any political significance, or whether they are just a normal increase due to popular demand.

BAHAMAS

According to the Globe Circler, special tests for Florida have been made through the following new stations, Z10 on 8140kc., ZFR on 3125kc., and ZFR2 on 5820kc. Under favorable conditions at the suitable times, it maye be possible to hear ZIO and ZFR2 in this country.

FRENCH MOROCCO

This unusual country now has another short-wave station in operation, namely CNP in Casablanca, which uses the 8795kc. channel between 6 to 7 a.m. Older listeners will remember CNR, which used to operate on 12,830kc., 23.38m. The quality of these stations was always poor. (IDA.).

U.S.A.

If the U.H.F. bands improve in the near future, listeners should listen for another new station in Denver which will use the call W9XLA, and operate in the 11-metre band on 25,400kc. We understand that there will be some delay in the inauguration of the new frequencies granted to the well-known Cincinnati station, WLWO, due to delay in arrival of special insulation material from England. (Globe Circler).

STATION ADDRESSES

COCX. Onda Corta Estacion COCX, "Casa Lavin," P.O. Box 32, Havana, Cuba.

ZBW3. Short Wave Station ZBW, P.O. Box 200, Hongkong, China.

WCAB. Columbia Broadcasting System, 485 Madison-avenue, New York City, N.Y., U.S.A.

XMHA. C/o Mr. E. A. Healey, 445 Race-course-road, Shanghai, China.

I2AA. C/o Ministry of Marine, Rome, Italy, or direct to E.I.A.R., Addis Ababa, Italian East Africa.

Listen for these!

OVERSEAS STATIONS NOW AUDIBLE

Here is a list of short-wave stations which have actually been heard over the last few weeks. Most of these should be heard by any of our short-wave fans who have a good set and location. Details of each station are given, and when also reported by readers, their names appear in brackets.

ENGLAND

GSA.—6050kc., 49.56m., Daventry. Comes in very well in the early morning, and at fair strength around 7 p.m. (Elliott, Foster, Cox, Clack, Medina, Gaden, Battis, Harris.)

GSB.—9510kc., 31.55m. This is an excellent station in afternoons, and also early a.m. and midnight. (Elliott, Foster, Cox, Clack, Battis, Gaden, Medina, Harris.)

GSC.—9580kc., 31.32m. A very good station right up till 9 a.m., also fair at 4.30 p.m. (Foster, Cox, Clack, Medina, Gaden, Battis, Harris.)

GSD.—11,750kc., 25.53m. Has been dropped from the session opening at 8.40 p.m., but heard in morning and from midnight. (Elliott, Cox, Silverthorne, Foster, Clack, Medina, Gaden, Harris.)

GSE.—11,860kc., 25.29m. Very loud station at 6.30 p.m., and also heard after midnight. (Foster, Cox, Medina, Gaden, Harris.)

GSF.—15,140kc., 19.82m. This station is now used from 8.40 p.m. and comes in at great strength. (Clack, Foster, Cox, Medina, Gaden, Harris.)

GSG.—17,790kc., 16.86m. This 16-metre band station is still holding up well at night around 9.30 p.m. (Elliott, Foster, Medina, Gaden.)

GSH.—21,470kc., 13.97m. During the last few weeks this one has weakened considerably at night. (Silverthorne, Gaden.)

GSI.—15,260kc., 19.66m. Can be copied at quite fair strength around 5 p.m. and also at 8 p.m. (Clack, Foster, Cox, Medina, Gaden, Harris.)

GSJ.—21,530kc., 13.93m. This station is now only reported from some locations at night, gradually weakening. (Elliott, Gaden.)

GSO.—15,180kc., 19.76m. This outlet is only fair in the early a.m., no entertainment value. (Clack, Medina, Gaden, Harris.)

GSP.—15,310kc., 19.6m. Only fair strength in the morning, and also at night. (Clack, Foster, Cox, Harris.)

GST.—21,550kc., 13.92m. This 13-metre station is practically inaudible until after midnight. (Gaden.)

GSV.—17,810kc., 16.85m. Not quite so loud as the other station on this band at night from 8.40 p.m. (Clack, Medina.)

GSW.—7230kc., 41.49m. In the early morning this one suffers from interference, but is much better between 5 and 7 p.m. (Gaden, Cox, Elliott, Foster, Clack, Medina, Battis, Harris.)

GRX.—9690kc., 30.96m. Good in the morning at 7, also at 5 p.m., 11.30 p.m., and also at 3 a.m. (Gaden, Medina, Clack, Cox, Foster, Harris.)

GSL.—6110kc., 49.1m. Reported as heard in New Zealand by Mr. Cox, but no other reports this month from other readers.

MYSTERY STATIONS

IN this issue we have one or two stations which have so far not been identified. Details of frequency, times, &c., are shown in the hope that some of our readers will be able to help.

48.7m. Station heard closing at 4.30 p.m. with God Save the King (Cox). (We think this is probably CJRO.)

31.57m. Station heard around 5.30 p.m. (Cox). (This would be YUC we think.)

50.2m. Station heard in early morning sounding like Portugal. (Gaden). (Think this would be CS2WD.)

25.7m. Chinese heard at night. (Gaden). (Almost certainly XGOK.)

29.88m. Chinese heard at night.

41.42m. European heard early morning. May be Czech or French.

ITALY

2RO3.—9630kc., 31.15m., Rome. Weaker in the mornings, and also in the Australian session closing at 5 p.m. News at 4.35 p.m. (Medina, Battis, Harris, Foster, Elliott, Gaden, Silverthorne, Cox, Clack.)

2RO4.—11,810kc., 25.4m. Can be followed quite well in early morning and is excellent at 6 p.m. (Cox, Medina, Clack, Battis, Gaden, Harris, Foster.)

2RO6.—15,300kc., 19.61m. Heard in early morning with same programme as 2RO4, also heard at night after 7, and good afternoon 4 till 5 p.m. (Medina, Cox, Gaden, Harris.)

2RO8.—17,820kc., 16.84m. Comes in at fair level at night after 8, and sometimes in forenoons. (Clack, Medina, Silverthorne, Gaden, Foster.)

2RO9.—9667kc., 31.03m. This Italian is now one of the best on the air in the early morning. (Medina, Silverthorne, Battis, Gaden, Foster, Harris.)

2RO12.—15,100kc., 19.87m. Another Italian station which has improved greatly in the mornings at 7.

2RO14.—15,230kc., 19.7m. This station is not always on the air, but when it is operating is heard usually around 9 p.m. (Cox, Gaden.)

2RO15.—11,760kc., 25.51m. This one is more regular and is heard often from 8 p.m. onwards. (Medina, Silverthorne, Harris, Cox.)

IRF.—9830kc., 30.52m. One of the loudest stations on the air until closing at 5.30 a.m. (Gaden, Medina.)

IQY.—11,700kc., 25.64m. Another early morning station, giving session in Russian till closing at 5.30 a.m. (Medina.)

FRANCE

TPA2.—15,245kc., 19.68m., Paris. Not used from 8 p.m., but heard at good strength at midnight. Also good from 3.30 a.m. (Medina, Clack, Gaden, Cox.)

TPA4.—11,885kc., 25.24m. Fair in the mornings and early afternoon. Quite good at 5.30 p.m. (Gaden, Medina, Clack, Cox, Foster, Harris.)

TPB3.—17,775kc., 16.88m. Still one of the best stations on this band at night. (Gaden, Medina, Clack, Silverthorne, Cox, Foster.)

FRANCE, (Cont.)

TPB7.—11,718kc., 25.6m. This one is heard best in the afternoons. Gives news at 2.30 p.m. and 3.15 p.m. (Medina, Clack, Gaden, Silverthorne, Cox, Harris, Foster.)

TPB25.—7280kc., 41.21m. This one is only heard in the very early morning. Gives news at 5 a.m. (Medina, Cox.)

TPC8.—11,845kc., 25.33m. At 7 a.m. this Paris station is louder than any other of their transmitters at any time. (Gaden, Medina, Silverthorne, Cox.)

TPC28.—9680kc., 30.99m. This one is now only fair, but the news session at 6.15 p.m. can be followed. (Medina, Gaden, Silverthorne, Cox, Harris.)

TYA2.—9037kc., 33.19m. Another Paris station heard at good strength at 6 a.m. and also at 5 p.m.

TPC.—9520kc., 31.51m. Heard in the morning opening at 7.30 a.m., also in afternoon till 4.45 a.m. Good strength. (Gaden, Medina, Cox, Foster, Harris.)

TPB6.—15,130kc., 19.83m. This one can again be heard, but now opening at 1.30 a.m. when it is quite strong. (Medina.)

AUSTRALIA AND OCEANIA

VLQ.—9615kc., 31.21m., Sydney. This station is being heard at great strength both in Australia and New Zealand. (Cox, Medina, Elliott, Silverthorne, Clack, Harris.)

VLQ2.—11,870kc., 25.27m., Sydney. This 25-metre outlet is also heard very well in its foreign broadcasts. (Cox, Medina, Elliott, Clack, Harris.)

VLQ5.—9680kc., 30.99m., Sydney. This frequency has now been given the call of VLQ5, instead of temporary one of 9590kc. (Medina, Cox, Clack, Elliott.)

VLR.—9580kc., 31.32m., Lyndhurst. Very strong in the early evening, but weakens at night, then strong at midnight. (Medina, Elliott, Silverthorne, Foster, Cox, Harris.)

VLR3.—11,850kc., 25.32m. Same location. This outlet comes in nicely during the daytime. (Cox, Medina, Elliott, Foster, Clack, Harris.)

VLW2.—9560kc., 31.38m., Perth. This frequency has been used for the special transmissions to South Africa in early morning.

VLW2.—9650kc., 31.09. Same location. One of the loudest stations on the band at night. (Medina, Silverthorne, Elliott, Foster, Cox, Clack, Harris.)

VLW3.—11,830kc., 25.36m. Same location. Heard at fair strength in the daytime in most locations. (Cox, Medina, Silverthorne, Elliott, Foster, Clack, Harris.)

VPD2.—9535kc., 31.47m., Suva, Fiji. Quite good strength, but inclined to fade a bit. Closes at 8 p.m. (Gaden, Harris, Medina, Clack, Cox, Foster, Elliott.)

FK8AA.—6122kc., 49.0m., Noumea, New Caledonia. Heard at fair strength late afternoon. Mr. Cox reports frequency as 6132kc., but still seems to be 6122kc. at our location. Will other readers please check? (Foster, Cox, Gaden.)

NEW STATIONS HEARD

WE list below all definitely identified new stations, or those heard for the first time. In cases where actual letters are not known, the station will be listed under its location until such time as its call can be definitely given.

KC.	Metres	Call	Location
6,090	49.25	ZNS	Nassau, Bahamas, B.W.I.
7,220	41.55	EAJ9	Malaga, Spain.
7,260	41.32	OZU	Skamlebaek, Denmark.
7,270	41.26	DXM	Berlin, Germany.
9,295	32.28	HI2G	Trujillo City, Dom. Rep.
9,355	32.05	HCETC	Quito, Ecuador.
10,310	29.09	"Radio Sofia"	Sofia, Bulgaria.
10,425	28.77	YBG	Medan, Sumatra.

NORTH AMERICA

WGEA.—15,330kc., 19.57m., Schenectady, N.Y. Now being heard quite well in the mornings, news at 7.30 a.m. (Medina, Clack, Gaden, Cox, Foster.)

WGEA.—9550kc., 31.41m. Same location. Heard twice in special programme till after 6.0 p.m. (Cox.)

WGEO.—9530kc., 31.48m. Same location. Very good till 8 a.m.; news at 7.30 a.m. News flashes at 7.55 a.m. (Gaden, Clack, Medina, Cox, Elliott, Harris.)

WCAB.—9590kc., 31.28m., Philadelphia, Pa. Heard well, Tuesday, Thursday, Friday and Sunday till 5 p.m. News at 4.55 p.m. (Gaden, Medina, Cox, Foster, Harris.)

WBOS.—9570kc., 31.35m., Boston, Mass. Heard in morning at 7 o'clock; also in late afternoons. Sundays till 5 p.m. (Gaden, Cox.)

WRUL.—11,790kc., 25.45m. Same location. One of the best Americans on the air till 8 a.m. (Gaden, Medina, Battis, Silverthorne, Cox, Foster.)

WRUW.—11,730kc., 25.58m. Same location. This Boston station can now be followed till around 10 a.m. (Gaden, Clack, Cox, Foster.)

WRUW.—15,130kc., 19.83m. Same location. When on the air gives fair signal till around 8 a.m. (Medina, Gaden, Battis, Foster.)

WLWO.—6060kc., 49.5m., Cincinnati, Ohio. Has improved since last month and now heard quite well at 9.30 p.m. (Gaden, Medina, Clack, Cox, Foster.)

WPIT.—11,870kc., 25.27m., Pittsburg, Pa. Usually heard quite well in the mornings from around 7 o'clock. (Medina, Gaden, Clack, Cox, Foster, Harris.)

WNBI.—17,780kc., 16.87m., New York, N.Y. Can still be heard quite well in forenoon till 11, also weakly at 11.30 p.m. (Medina, Gaden, Foster.)

WRCA.—9670kc., 31.03m. Same location. Only moderate strength in the afternoon till closing at 4 o'clock. (Cox.)

WCBX.—17,830kc., 16.83m. Same location. Can now be heard weakly from around 11.30 p.m.

WCBX.—15,270kc., 19.64m. Same location. Quite a fair signal from this one till 6.30 a.m. (Gaden, Medina, Cox.)

WCBX.—11,830kc., 25.36m. Same location. A good station on this band in the mornings from 7, sometimes 6.30. (Clack, Medina, Gaden, Foster, Elliott, Battis, Silverthorne.)

WCBX.—9650kc., 31.09m. Same location. Can just be heard as they close down at 2.30 p.m.

WCBX.—6170kc., 48.62m. Same location. Rather noisy in the late afternoons till closing at 5. (Medina, Cox, Gaden.)

WCBX.—6120kc., 49.02m. Same location. This frequency was used in February. Usually alternates monthly. (Medina, Cox.)

KGEI. — 15,330kc., 19.57m., Treasure Island. On some days this station is heard as late as 4 p.m., usually closes 2.15 p.m. (Gaden, Medina, Foster.)

KGEI.—9530kc., 31.48m. Same location. Increases in strength till 6 p.m., and very good at 2 a.m. (Gaden, Medina, Cox, Battis, Silverthorne, Harris, Foster, Elliott.)

WNA.—9170kc., 32.72m., Lawrenceville, N.J. Heard one morning at 6.45 with special programme.

WDJM.—6040kc., 49.67m., Miami, Florida. Heard at fair strength in New Zealand in late afternoon. (Cox.)

KEI.—9490kc., 31.61m., Bolinas, Cal. Special programme for an oil company, "The Gondoliers" heard in late afternoon. (Cox.)

XEQQ.—9680kc., 30.99m., Mexico City, Mexico. Good station till closing at 4 p.m. Opens weakly at 1 a.m. with "Bolero." (Cox.)

XEWW.—9503kc., 31.57m. Same location. Heard at great strength, Sunday, March 3, till after 5 p.m. Suspect power increase. (Cox, Harris.)

XEXA.—6175kc., 48.58m. Same location. On some nights is now quite strong from 11 p.m.

VLW4 PERTH TO OPEN 7th APRIL

A SPECIAL service directed to South Africa will commence on Sunday, 7th April, at midnight, Western Australian time, when a new transmitter, VLW4, will be used. It will operate on a frequency of 9665kc., 31.04m. The Minister for Information, Sir Henry Gullett, will give a short talk after the opening announcement, and later a news bulletin in English will be given.

SOUTH AMERICA

HJFK.—9730kc., 30.83m., Pereira, Columbia.. The loudest Colombian on the air at present, good opening at 10.0 p.m. (Harris, Medina, Foster, Elliott.)

HJFH.—9750kc., 30.77m., Armenia, Colombia, "La Vox de Armenia" quite good signal on this harmonic of 4875 kc. Opens with march 11 p.m.

HJAB.—9570kc., 31.35m., Barranquilla. The mystery Colombian heard under WBOS. Heard twice Sunday mornings at 7 a.m. (Harmonic of 4785kc.)

HJAG.—9810kc., 30.58m., Barranquilla. Harmonic of 4905kc. heard at 7 a.m., also once opening at 11 p.m.. (Also gives broadcast call HJAH.)

HCETC.—9355kc., 32.05m,, Quito, Ecuador. New station opens 10 p.m., then news in Spanish, and music till closing 10.45 p.m. See article.

CB970.—9730kc., 30.83m., Valparaiso, Chile. On the air nearly every night from 10, but mixed with HJFK. Verifies promptly.

CB1170.—11,700kc., 25.64m., Santiago, Chile. Best heard on Sundays, occasionally stays on air till 3 p.m.

CB1180.—11,945kc., 25.12m., Santiago, Chile. Opens now at 9.30 p.m., chimes before opening, time signal at half-hour, two marches, then announcement "Radio Societad de Agricultura de Santiago de Chile," followed by news. Verifies promptly. (Foster.)

CD1190.—11,910kc., 25.19m., Valdivia, Chile. Heard on Sundays till 3.30 p.m. sometimes, closes with organ selection and time signal. (Cox.)

LRX.—9660kc., 31.06m., Buenos Aires. Heard now in the mornings, opening at 8.30 a.m. Verifies promptly. Radio el Mundo. (Cox.)

LRA1.—9688kc., 30.96m., same location. Still being heard on Sunday and Monday mornings, opening at 9, but very weak.

CXA8.—9640kc., 31.12m., Montevideo, Uruguay. Heard on Sunday afternoon till 4 p.m. Announces in English on closing, Radio Belgrano, also uses other languages. Verifies promptly. (Cox.)

HCJB.—12,460kc., 24.08m., Quito, Ecuador. This one has been much louder this last month at night at 11 p.m. Gives call in English, also slogan "La Vox des Andes." Verifies promptly. (Medina, Clack, Harris, Foster, Silverthorne.)

OAX4J.—9340kc., 32.12m., Lima, Peru. Sometimes heard in the morning at 7, but best on Sunday till 4 p.m. (Foster.)

OAX5C.—9400kc., 31.91m., Ica, Peru. Another Peruvian station heard on Sunday afternoon till 3 p.m.

HCODA.—9445kc., 31.77m., Guayaquil, Ecuador. This infrequently heard station was tuned in faintly one Sunday till closing at 2 p.m. Slow in verifying, but sends nice card.

OAX4Z.—6080kc., 49.34m., Lima, Peru This station has been heard by Mr. Cox in New Zealand in the late afternoons.

CXA6.—9625kc., 31.17m., Montevideo. Uruguay. Another South American audible in New Zealand in recent weeks.

AFRICA

ZRO.—9755kc., 30.75m., Durban, South Africa. Has improved slightly in the early mornings around 2 a.m.

ZTE.—11,800kc., 25.42m., same location. Carries the same programme, but not as strong as ZRO.

ZRL.—9606kc., 31.23m., Capetown. On some mornings is now quite loud at 2 a.m.

ZRH.—6007kc., 49.94m., Pretoria. In the mornings can be heard at fair strength at 6.30 a.m. (Medina, Foster.)

ZNB.—5900kc., 50.95m., Mafeking, Bechuanaland. Can now be heard quite well till closing at 5.30 a.m.

12AA.—9650kc., 31.09m., Addis Ababa. This African station is still coming in nicely at 5 a.m. (Medina.)

CR7BE.—9640kc., 31.12m., Lourenco Marques, Mozambique. Still heard, but not very strong from 5 till 7 a.m.

VQ7LO.—6083kc., 49.32m., Nairobi, Kenya. A very good signal from this British-owned station in the early morning. (Medina.)

Radio Tananarive.—6063kc., 49.48m., Tananarive, Madagascar. Greatly improved on opening at 1 a.m.

Radio Tananarive.—9870kc., 30.4m.. same location. Also heard at same time on this frequency, note change from 9695 kc. (Medina.)

INDIA AND ASIA

KZRH.—9640kc., 31.12m., Manilla, P.I. Very good signal every night from around 6.30 p.m. Also good in mornings at 8 o'clock. (Clack, Medina, Harris, Elliott, Foster, Gaden, Silverthorne, Cox).

KZRM.—9570kc., 31.35m. Same location. Good strength at night. News at 8.30 and 10.45 p.m. Also heard opening at 7.30 a.m. (Clack, Medina, Harris, Foster, Elliott, Gaden, Battis, Silverthorne, Cox).

KZIB.—9500kc., 31.58m. Same location. Another Manila station which is heard nightly at good strength. (Clack, Medina, Silverthorne, Gaden, Harris, Cox, Elliott, Foster).

KZIB.—6040kc., 49.67m. Same location. This station is very noisy and of no entertainment value. (Medina, Gaden, Foster, Cox).

KZEG/KZRF.—6140kc., 48.86m. Same location. Some very enjoyable programmes from this one every night. (Medina, Gaden, Staffan, Clack, Cox, Foster, Elliott).

KZRT or P.—6100kc., 49.18m., Manila. This station is reported by Mr. Battis audible at night. Not reported elsewhere as yet.

ZHP.—9700kc., 30.94m., Singapore. S.S. Good strength nightly, gives news 10 p.m., also B.B.C. news at 11.15 p.m. (Medina, Clack, Silverthorne, Harris, Cox, Elliott, Foster, Steffan, Gaden, Battis.)

ZHJ.—6100kc., 49.18m., Penang, S.S. This station reaches good strength from about 10.30 p.m. Closes at 11.40 p.m. (Clack, Medina, Foster, Harris, Cox, Elliott).

MTCY.—6125kc., 48.98m., Hsinking, Manchukuo. Still heard nightly with native type programme. (Medina, Gaden, Silverthorne, Foster, Harris, Cox).

MTCY.—11,775kc., 25.48m. Same location. Opens at 7 a.m. with news in English. (Medina, Battis, Gaden, Foster, Cox).

RADIO SAIGON.—11,780kc., 25.47m., Saigon, F.I.C. This is the loudest station on 25m. band at night. Opens at 8.45 p.m. (Clack. Medina, Harris, Elliott, Foster, Steffan, Silverthorne, Cox).

RADIO SAIGON.—6116kc., 49.05m. Same location. This other Saigon outlet can also be heard faintly every night. (Medina).

SAIGON.—6215kc., 48.27m., Saigon. This other F.I.C. station which we believe to be "Radio Boy Landry," can be heard nightly.

CRY9.—6080kc., 49.34m., Macao, Portuguese China. Only heard on Monday night from 11.30 p.m.

HSP6.—7968kc., 37.65m., Bangkok, Thailand. Quite good strength when it opens at 11 p.m.: gives news at 11.45 p.m. (Medina, Clack, Battis, Elliott, Foster, Silverthorne, Gaden).

XYZ. — 6007kc., 49.94m., Rangoon, Burma. Another Asian station which can be tuned in around midnight. (Medina, Gaden, Foster, Cox).

ZBW3. — 9625kc., 31.5m., Hongkong, China. Quite a loud station, but very often is hard to separate. (Medina, Gaden, Silverthorne, Cox, Foster).

XGOY.—9500kc., 31.58m., Szechwan, China. Has been heard in the early mornings till closing at 7 a.m.

XGOY.—11,900kc., 25.21m. Same location. Still being heard at night at good level. News at 9.30, 10.30, and 11.30 p.m. (Medina, Clack, Harris, Elliott, Foster, Steffan, Gaden, Silverthorne, Cox).

XGOY.—9645kc., 31.1m. Opens at good strength every night at midnight with news in English by lady. (Medina, Gee).

XGOX.—15,200kc., 19.74m., Szechwan. Heard well in the early evening, and also at midday. Gives news at 5.10 and 7.30 p.m. (Medina, Silverthorne, Clack, Gaden, Harris, Cox).

XGOK.—11,650kc., 25.75m., Canton. Heard at fair level every night; news at 11.15 p.m. by lady. (Medina, Silverthorne, Harris Foster).

XMHA.—11,855kc., 25.3m., Shanghai. This staion is a little stronger than it was last month. (Medina, Silverthorne, Gaden, Elliott, Foster, Harris, Clack, Cox).

XTC.—9295kc., 32.28m. Same location Opens every night just before 11 p.m. at fair strength.

XGSE.—9760kc., 30.74m., China. Not sure of call-letters, either XGSE or XPSE we think. Asking for reports Heard from before 10 p.m.

XPSA.—7010kc., 42.8m., Kweiyang. Not as loud as previously but news can be followed at midnight. (Medina Clack, Foster, Cox.)

JVH.—14,600kc., 20.55m., Tokio. This station has been heard in special programmes at night by Mr. Cox.

ZI.—9535kc., 31.47m., Tokio. Quite a strong station when on the air, but hard to separate at night. (Silverthorne, Foster, Harris.)

ZJ.—11,800kc., 25.42m., Tokio. Very good in early morning between 6 and 7, also heard at night at 10.30 p.m. (Medina, Clack, Battis, Steffan, Harris, Cox, Foster.)

ZK.—15,160kc., 19.79m., same location. Comes in nicely in early morning, also at night. (Medina, Battis, Cox.)

VW.—7257kc., 41.34m., same location. This station is now very loud in mornings till closing at 7.0 a.m. (Medina, Foster, Cox.)

LG3.—11,705kc., 25.63m., same location. This Japanese is now weaker at night. (Medina, Foster.)

VW3.—11,725kc., 25.59m., same location. Comes in at very good level every night. (Medina, Silverthorne, Cox, Harris.)

VZ3.—9695kc., 30.95m., same location. Not regular now, but when on air is interfered with by ZHP.

LT2.—9645kc., 31.1m., same location. Only heard very weakly in the very early morning. (Medina.)

IE3.—9695kc., 30.95m., Tyureki, Taiwan. Can be followed at fair level from 12.5 a.m.

YDC.—15,150kc., 19.8m., Bandoeng, Java. Still being heard well at night, also in the mornings weakly. (Gaden, Medina, Silverthorne, Foster, Elliott, Cox, Clack, Harris.)

YDB.—9550kc., 31.41m., Soerabaja, Java. Now quite loud every night at midnight. Also heard weakly on 19.6m. at 5 p.m. (Medina, Clack, Harris, Cox, Foster, Battis.)

YDD.—6045kc., 49.63m., Bandoeng, Java. Heard at night but rather hard to follow through interference. (Cox.)

YDX.—7220kc., 41.55m., Medan, Sumatra. Comes in well with native programme at night, and later N.I.R.O.M. regular. (Battis, Medina, Foster, Clack.)

PLP.—11,000kc., 27.27m., Bandoeng, Java. Can be tuned in nightly at varying strength, depending on location of listener. (Battis, Cox, Medina, Silverthorne, Foster, Elliott, Clack, Harris.)

PMH.—6720kc., 44.64m., same location. This is another of the N.I.R.O.M. night stations with native programme. (Medina, Foster, Cox, Clack, Harris.)

PMN.—10,260kc., 29.24m., same location. A very consistent station over a long period of months. Heard nightly. (Medina, Silverthorne, Cox, Elliott, Clack, Harris.)

VUD2.—9590kc., 31.28m., Delhi. India. For some considerable time now this station has been excellent at night. News at 10.30 p.m. (Battis, Cox, Silverthorne, Foster, Clack, Medina, Harris.)

VUD3.—15,290kc., 19.62m., same location. This one can be heard quite well at 6.0 p.m. (Foster, Clack, Cox.)

VUD.—11,870kc., 25.27m., Delhi. This new 25-metre station is nearly as strong as VUD2 from opening at 9.30 p.m. This may be Madras, but they only mention Delhi. (Battis.)

XYZ.—6056kc., 49.54m., Rangoon, Burma. This new Burmese station has again been heard, this time by Dr. Gaden.

YBG.—10,425kc., 28.77m., Medan, Sumatra. Heard nightly around 11 p.m., calling Bandoeng.

CENTRAL AMERICA AND WEST INDIES

COCO.—8700kc., 34.48m., Havana, Cuba. Not very loud, but can be heard now from just before 11 p.m. Church service in English on Sundays from 10.30 p.m. Relays same programme as CMCK.

COCQ.—8830kc., 33.98m., same location. Best heard at night from 10 p.m., also audible in afternoon. Closes Sunday 4 p.m. or later. Verifies. (Cox, Foster, Medina, Harris, Gaden.)

COCQ.—6375kc., 47.06m. Used in parallel with other outlet, but not heard here in afternoons. (Gaden, Harris, Medina, Foster, Cox.)

COBZ.—9025kc., 33.13m., same location. Heard opening at 10.45 p.m., also faintly on Sunday afternoon till 4 p.m. Gives call in English.

COCX.—9200kc., 32.61m., same location. "La Casa Lavin." Opens at 11 p.m., good strength. Sunday afternoon faintly till 3 p.m. Relays CMX.

COBY.—9215kc., 32.55m., same location. Heard till 5.20 p.m. one Sunday, special programme for Guatemala. Notice corrected call, not COCY.

COBC.—9380kc., 31.99, same location. Another good Cuban heard from 10 p.m., and also in afternoon till 3.0 p.m. "El Progresso Cubano." (Gaden, Foster, Medina.)

COCH.—9440kc., 31.78m., same location. on two occasions have heard till 5 p.m., also good from 10 p.m. except for morse interference. (Harris, Cox, Medina, Gaden.)

COCM.—9825kc., 30.54m., same location. Not very loud, but audible nightly from 11 p.m. Occasionally from 10.30 p.m. Verifies promptly.

COCW.—6330kc., 47.39m., same location. Has improved greatly since last month, opens at 10 p.m. "La Vox del Radio Philco."

COHI.—6455kc., 46.48m., Santa Clara. One of the best on the air, opens at 9.45 p.m. at good strength. (Gaden, Harris, Medina, Foster, Cox, Clack.)

ZNS.—6090kc., 49.25m., Nassau, Bahamas, B.W.I. This is the new station mentioned in separate article.

HP5A.—11,700kc., 25.64m., Panama City, Panama. Heard best just after 10 p.m. week nights. Verifies reports, but rather slow. (Harris, Foster.)

HP5G.—11,780kc., 25.47m., same location. Heard on two Sunday afternoons till 6 p.m. testing, relays HOA. Slogan, "Ron Dalley." Verifies. (Cox.)

HP5J.—9607kc., 31.23m., same location. Not a regular station at 10 p.m., but heard on favorable nights. Slow in verifying.

HP5K.—6000kc., 50.00m., same location. One of the easiest heard Panama stations, opening at 10 p.m. Verifies correct reports, but slow. (Cox, Foster.)

TIPG.—9620kc., 31.19m., San Jose, Costa Rica. Well-known to all listeners from 10 p.m. Slow in verifying. (Ours took 12 months.) (Harris, Cox, Medina, Steffan.)

TIEP.—6690kc., 44.84m., same location. Now a regular station, opening at 10.30 p.m. "La Vox del Tropico." Has not verified our report of over two years ago. (Foster.)

TILS.—6165kc., 48.66m., same location. Now only occasionally heard. Has not verified our report of about nine months ago.

HI2G.—9295kc., 32.28m., Trujillo City, Dominican Republic. Heard best on Sunday mornings around 7 a.m., also occasionally at 10.30 p.m.

TGWA.—15,174kc., 19.77m., Guatemala City, Guatemala. Still coming in well on Monday morning at 7 a.m. Verifies promptly. (Battis, Medina, Harris, Cox, Silverthorne.)

TGWA.—9685kc., 30.98m., same location. Not as good as last month, but heard best on Sunday afternoons till quite late. Verifies. (Battis, Cox, Medina.)

TGWB.—6445kc., 46.55m., same location. Has improved greatly since last month. Heard best on opening at 10.45 p.m. Verifies.

TGQA.—6400kc., 46.88m., Quezaltenango, Guatemala. Best time to hear this one is Sunday night on opening at 10.30 p.m. Verifies. (Cox.)

TG2.—6190kc., 48.47m., Guatemala City. Heard every night after 10.30 p.m., but best on some Sundays till as late as 6 p.m. Verifies. (Cox.)

THIS MONTH'S VERIFICATIONS

WE have received the following verifications from stations logged during the last few months. Stations so verified are listed each month.

CR7BE.—9640kc., 31.12m., Lourenco Marques, Mozambique. The manager of this station sent an interesting letter verifying our report of December 26. They also advise us that from March 18 the power of this station will be increased to 10kw. The address is Radio Club of Mozambique, P.O. Box 594, Lourenco Marques.

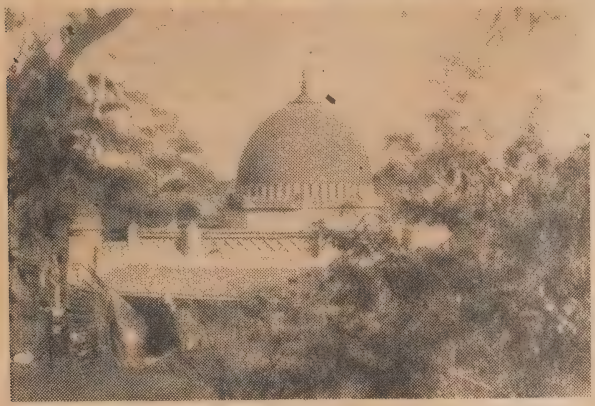
TIPG.—9620kc., 31.19m., San Jose, Costa Rica. After a very long wait this popular station sent along a very attractive card, showing views of their transmitter, and also the Costa Rica Military Band. The address of this one is Perry Girton, P.O. Box 225, San Jose, Costa Rica, Central America.

HSP6.—7968kc., 37.65m., Bangkok, Thailand. The usual HS8PJ card is sent for this station, with the call altered to HSP6. Reports should be addressed to Mr. Soontorn Hongladaromp at the Department of Publicity, Bangkok, Thailand.

WCBX.—15,270kc., 19.64m., New York, N.Y. This Columbia Broadcasting System station sent their usual plain verification card confirming our reception on frequency No. 5, which is 15,270kc. The same card is sent for all frequencies, but the one actually verified is always stated.

CAMERAS

WHAT'S WRONG WITH THESE?



Being some candid comments on typical "beginner" photographs. Good pictures are impossible unless you take care of composition.

THE SYDNEY ZOO

THIS, as was pointed out in the accompanying letter, is the elephant house at Sydney Zoo. Although I have a fair idea of what the photographer was grasping for, it is still a rather meaningless picture, with a commendable idea behind it.

First of all, it tells no story beyond that of a dome-roofed building almost hidden by trees and shrubbery. Apparently, those trees and shrubbery were arranged on either side to give what was meant to be a balanced, romantic peep at an unusual structure. Furthermore, the camera was aimed into the sun, giving flat greyness.

But that is not good enough; for the building means nothing and shrubbery looms in the picture. With considerable cutting it could be greatly improved. But nothing will make a good picture of it.

A NATIVE SCENE

In this picture, to begin with, there is far too much foreground. It is not even interesting foreground—just dry river-flat; or, at least, that is what it looks like.

On top of that, the background is out of focus, and the whole thing is too dark and too flat. Apparently, the shot was taken in the late afternoon or early morning. Under these circumstances, a good filter and a considerably longer exposure would have helped, because, apparently, there was a lot of green about. Never try to get too much into one picture—for that is what has happened here. Instead of getting a good shot of one native house, the photographer has popped his shot away, offhand, of an entire village. The result is that the eye does not know where to look.

Every picture must have a central focussing point to which the eye will naturally fly.

SNAPSHOTTING WITH INTELLIGENCE!

Snapshotting is everything a fellow's hobby ought to be. It's fun from the first, and the sport never grows stale. It is, too, the hobby that fits in with every other pastime.

Simple box cameras are available for a very low figure nowadays, and one of these will give you plenty of fun from the start. But the biggest thrill of all, and one that never fails, is the thrill the amateur gets when he sees his picture "come up" in its developing bath. Very little equipment is needed to start the work of developing and printing your own.

Enlarging is another of the wonders of photography, and that, too, is easily done at home. With a home enlarger you can make large pictures you will be proud to frame and keep.

Picture-making at night is a great sport for the home—thanks to new super-sensitive films of lightning speed and low-priced, yet high-powered, electric light bulbs. Or, if you live out of range of house electricity supplies, flash-light photography has also become a simple matter.

TRICK PICTURES

Trick photography in its various forms also appeals to boy photographers. This photography is easy enough, like many worth-while tricks. Here's the scheme. When the door rattled downstairs last night—maybe it was the wind—or maybe it was a ghostly visitor. If the photographer was hiding close by he had no trouble in photographing what went on. He need not tell that he made a double exposure.

First, he photographed the door, just as if he were "shooting" that and nothing else. Then, without moving the film, he dressed a confederate in a sheet. This entirely material ghost took up his position at the door, and the picture was snapped again—this time with the shutter set for only half the exposure time required to make the photograph of the door. You see, it is just as easy to make a double exposure by meaning to as it is by forgetting to wind the film.

THREE IN ONE

Have you a friend that you like so much you would like to have three of him? Then your camera will produce the three—in one picture!

First hang up or find a plain, dark background, preferably black, without any markings or wrinkles to distinguish one part from any other part. Dress the boy in light clothes. Then comes the exposure in the case, not double exposure this time, but triple exposure.

Focus the camera, which must be on a tripod or some other firm support. Have the boy stand in front of the background in such a position as to appear toward one side of the finder.

hen snap the shutter. Without wind-
g on the film, and with care not to
ove the camera, direct the boy to the
ntre of the finder and snap the shut-
r again.

Repeat the procedure for the other
de of the picture. Each exposure
ould be of the proper length of time
) take the picture if no "funny busi-
ess" were involved. Each placing of
ie boy in the finder should avoid over-
pping the space representing an ad-
)ining image.

The result? Obviously, triplets having
heir picture taken. If the background
dark and plain, the area of the back-
round in front of which the brightly-
ressed boy stood for the first exposure
'ill not obliterate the figure on the film
'hen the boy moves over for the later
xposure.

OOK AROUND!

Some people have the notion that the
nly pictures worth taking are those
f unusual things. They take a camera
long when they travel, but seldom use
t at home unless something special is
appening. But, believe it or not, some
f your greatest possibilities are around
he house.

"But," you may say, "I have already
nade good snaps of the house, the fam-
ly, the pets, the garden, and the new
ar. What else is there to shoot?"

I can't answer that question for you
irectly. But I'll wager that there are
ozens of other picture possibilities, and
all of them as interesting as the ones now in your album, and potential prize-winners.

The secret of finding them is simply a matter of keeping your eyes open Get the habit of looking at things—everything—as though you have never seen it before. It's quite amazing the way this habit will sharpen your interest.

BE ENTERPRISING!

Don't be afraid of doing things in unusual ways. It's really a tonic to take pictures of old things and scenes from a different viewpoint. Don't have people in stiff, unnatural poses when taking snapshots. Snap them when they are doing something, or, at least, apparently doing something, instead of having them stand as stiff and straight as a totem pole. Study your various subjects for unusual angles from which you may snap your pictures for unusual effects.

Take it for granted that present-day cameras, films, and modern Photo-Flood and Sashalite lamps give you an unlimited scope for unusual, fascinating snapshots. To-day almost any picture is possible—and at any time.

You are progressing in your use of a camera when you reach that stage when your friends say: "Well, look at that picture! I've seen that spot every day for the last ten years, and never dreamed it had the makings of a picture like that."

WHERE AND WHY BLOCKING CONDENSERS ARE USED

BLOCKING condensers are used whenever it is desired to exclude the flow of direct current from a certain part of a circuit and at the same time provide an easy path for the passage of alternating current. Thus a blocking condenser is used in series with the grid of a valve in resistance or impedance-coupled amplifier circuits. The condenser allows fluctuating voltage for grid excitation to pass, but isolates the grid from the plate direct current. When used for this purpose the condenser is often called a grid-coupling condenser and the circuit needs a grid resistor for the following valve to provide it with grid bias.

USES OF RADIO FREQUENCY CHOKES

RADIO frequency chokes are used in circuits whenever it is desired to block the passage of high frequency currents and at the same time not interfere with the D.C. or lower frequency currents. For instance, one use of an R.F. choke is in the plate circuit of a valve to isolate the R.F. component of the plate current from the D.C. component.

Any Camera Can Take Snapshots At Night Now!

All you need is fast Kodak Super Sensitive Panchromatic Film and inexpensive Photoflood Bulbs, and you are ready to enjoy the fun of making pictures at night — spontaneous, true-to-life pictures you will treasure for your album.

FREE!

Post the coupon for latest photographic booklets.

NAME .....

ADDRESS .....

.....

Of all Kodak Dealers and

KODAK (Australasia) Pty. Ltd.

379 George Street, Sydney.
9 Wolfe Street, Newcastle.

HIGH SPEED KODAK FILM MAKES NIGHT SNAPSHOTS EVERYBODY'S HOBBY

Make Photography Your hobby!

MAGIC AND MAGICIANS

By BARRY KENT

In the July issue of "Radio and Hobbies" of last year appeared a photograph of Australia's representative magician—The Great Levante, now appearing with outstanding success in England. Much has happened since then. Levante headed a group of English magicians on a visit to America in order to attend one of the biggest Magical Conventions of all time.

OVER twenty English magicians travelled over to America to be present, and, according to all reports, a wonderful time was had by all. On his return to England, Levante made all arrangements for a visit to Australia—his home country. He was to have been here in July this year—opening in Melbourne with his world's great magical production "How's Tricks."

What a mighty welcome awaited him here in Australia, for Les, as he is popularly known to magicians of all ranks, is tremendously well-liked by all, both here and in England. American magicians and public took him to their hearts and made him as one of their own.

Then comes the war. All his plans for a visit home are cancelled indefinitely, and I can ask again, as I did in the July issue of 1939, "When will Australia see LEVANTE and his mighty production, 'How's Tricks'?"

In his letter to me, received this week, Levante tells me how keen he is to come back to Australia and his many friends. It must be remembered that this is his fourth year in the British Isles, and his show has grown to great proportions. He is working continuously with a full two-hour magic show—this he presents in most instances twice nightly.

He was appearing at Sunderland, on the east coast of England, during the week he wrote, and this is just a short extract from his letter:—"I am at Sunderland this week. The town is flown over regularly by German aircraft. We are expecting bombs daily, but it doesn't happen." In order to give you some idea of his great show, here are a few items to consider.

He carries twenty tons of equipment, twenty-four assistants—fourteen girls and ten men; a musical conductor; a wardrobe mistress; a manager and a secretary. His charming wife and daughter also appear in the production; however, they are better known to us here as Gladys, Esme and Les. His visit is not CANCELLED, but merely POSTPONED.

MAGIC MADE EASY !

VASE OF ALLAH.—A piece of rope placed into the neck of this vase and the vase becomes suspended on the rope 2/6

Anti-Gravity Glasses .. 2/-
Phantom Razor Plate .. 2/6
Torn & Restored Newspaper 2/6
Presto Coin Box 2/6
Ball Escapo 3/6

CHINESE LINKING RINGS.—A set of these famous Rings will link and unlink at the magician's will. Size 6ins. 10/6

Ball Through Glass .. 10/6
Egg Back Trick 3/6
King Pack of Cards . 3/6
Cigarette Catching Trick 1/-
Dante 4 Ace Trick .. 1/-

BOOKS ON MAGIC

New and Easy Magic.
My Mysteries.
Simplified Conjuring.
Money Magic.
Matchstick Magic.
Paper Magic.
100 Tricks You Can Do.

1/9 ea.

Tricks with Cards, 1/3 (Post Paid).

JOKERS' NOVELTIES

LATEST IDEAS FROM OVERSEAS !

Snooty Pups .. 3/- Invisible Ink .. 1/-
Walking Matchbox 2/- Jumping Flea . 1/-
Spooky Spider .. 1/6 Squirting Cigarettes 1/6
Suction Egg Cup 6d
Sneeze Powder. 6d Exploding Matchbox 1/6
Snake Pen 9d

BECOME A MAGICIAN !

Send 3d in Stamps for Booklet and Catalogue of Jokers' Novelties and Magic Combined, or free with any order for 5/- or over. Magic Dept.—Ground Floor.

MICK SIMMONS LTD.

712-722 George St., Haymarket, Sydney.

MORE MOVIE MAGIC

In the latest picture now appearing at various theatres throughout Australia and New Zealand, magicians will see much of interest to them. Tricks and illusions you have read about were included by the producer of this weird picture to give added interest to an otherwise entertaining production.

YOU will see doors that open magically when the name of "Cagliostro" is spoken, and close again on uttering the words, "Robert Houdini." "Miracles for Sale" is the picture, and it contains a number of excellent illusions and things magical. It was adapted from Clayton Rawson's novel, "Murder in a Top Hat," and the story is laid among a group of professional magicians and clairvoyants.

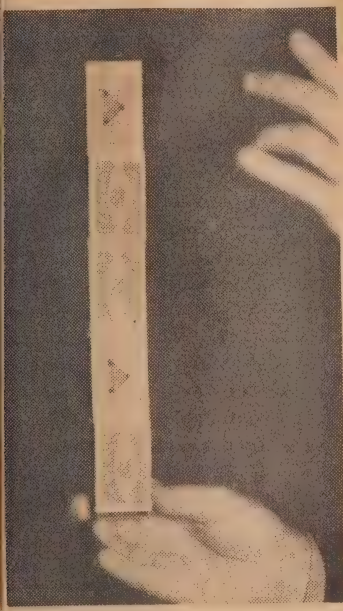
Among the many illusions is a new version of the "Sawing a Woman in Halves," a new "Headless Woman" illusion, a good bullet-catching trick, and several other excellent escape tricks, together with an odd spiritualistic seance or two.

Well-known American magicians assisted the director in the production, chief of whom were Chester Morris and Paul LePaul—both professional magicians.

For the first time in the history of the screen, an actor's eyes are actually made to change color. Henry Hull appears with his own jet black eyes in one part of the picture, and then later on with light blue eyes. How this transformation is accomplished is fully explained in the picture—very interesting. See it by all means.

Apparatus used in an escape trick in the picture "Miracles For Sale."

THE BALANCING MATCH BOX PYRAMID



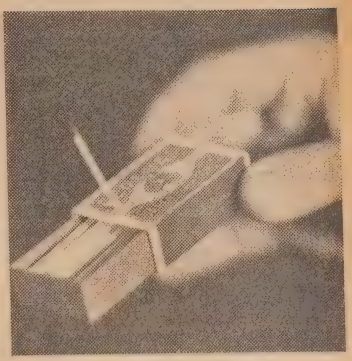
THIS looks difficult—balancing a number of match boxes, one upon the other, and making them hold their position. When you do it people think it is fine balancing.

HOW: In setting the boxes in position, push each drawer slightly up into the box above, thus locking the boxes. The balance is then easy.

LIFE OF THE PARTY!

IT may seem strange to advise against being a clown of any kind, when so many people and advertisements are telling one how to be the centre of attraction. Do not hold the spotlight continually, even though you may be quite capable of presenting numerous excellent tricks better than others at the party. It is better to go "so far" and "so far" only. The so-called "life of the party" constantly challenges attention, and is therefore always liable to criticism.

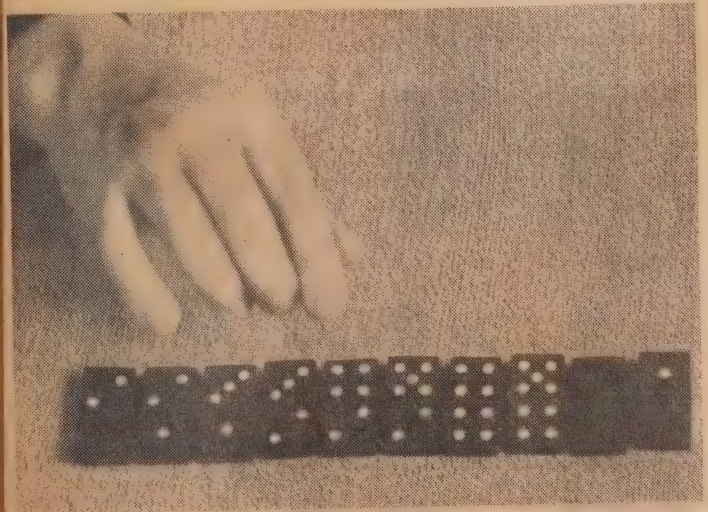
HAVE A MATCH



THIS is frequently called "The Obliging Match," for as the box is opened by you to the usual request, "Have you a match?" one comes out immediately of its own accord, raising itself from the others as you push the box open.

HOW TO PREPARE IT: Punch a small hole in the end of the box at the top. Insert the match so only the head shows. It will not be noticed. Now push the drawer—and presto! Up rises the match in a mysterious way.

TEN MYSTERIOUS DOMINOES



TEN dominoes are laid in a row on a table, with their backs up. Any person is invited to move any number of dominoes from the left to the right—one at a time. Then the magician TURNS UP a domino, and, strange to relate, the number of spots on this domino tells the number of dominoes you have moved.

HOW: Arrange the dominoes as shown in the photograph. Always turn up the second from the RIGHT after the moving. It will bear the number of spots according to the number moved. If none are moved, a blank turns up.

1500 FREE TREATISES ON MAGIC!

YOU can become a highly skilled conjurer — amaze your friends, earn money in your spare time! You learn quickly and easily in your own home. Why remain a nobody? Get out of the rut—lead the wise ones up the garden path, and then show them how easily you can do it!

I offer you this astounding Treatise on Conjuring and Magic absolutely FREE. If you are interested in Magic, then it is literature you cannot afford to be without. You can earn from £5 to £20 a week as a Magician! There is a great demand for entertainers everywhere. Now is your chance to be "different" from the rest—to raise your popularity and earn good money. Secrets of Magic Revealed at Last! You learn 250 tricks and stage illusions—you can do them yourself before your friends and (continuances).

HURRY FOR YOUR COPY

THIS startling treatise has been the turning point in hundreds of lives. No literature of its nature has ever been offered before; it gives you the inside information on conjuring, card-sharping, illusions, and hundreds of startling tricks. Post coupon this very moment.

POST NOW

HERBERT HOLMES, Dept. 27, 24 Clarence St., Sydney.

Name .....

Address .....

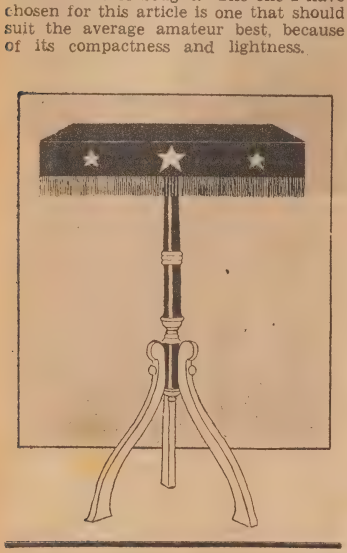
(Enclose stamp for postage.) 1/4/40.

BUILDING A MAGICIAN'S TABLE

LIGHT AND COMPACT DESIGN

Here is an article which tells you how to make a particularly useful article for magic enthusiasts. A well-made table will help you to "put over" your shows in professional style.

IN last month's issue I told you I would give you an idea how to build your own Magician's Table. This was because so many had written to me about tables for magicians. There is quite a number of kinds of tables that can be made or bought. The one I have chosen for this article is one that should suit the average amateur best, because of its compactness and lightness.



I would suggest a small table of about 12 by 18 inches in dimensions. Obtain a lightweight wood with the grain running horizontal to the longest side, and screw two strengthening pieces of wood to the underneath ends. These pieces may be about 1½in. by 10in. and are placed in position merely to give strength to the table.

COVERING THE TOP

Cover the top with a good quality velveteen and tack the edges neatly to the under side of the board. Some performers prefer a felt material instead of velveteen; this is merely a matter of choice. Personally I prefer the velveteen—it has a richer black, and black is a good color for many reasons when arranging magical apparatus.

When this has been made, the next thing to make is a small drape to go round three sides of the table—there is no need to drape the side facing away from the audience. Again, I would suggest a good quality velveteen—or if you fancy something more elaborate, plush is nice and rich in appearance.

This drape can be about six to ten inches deep, with a nice bullion fringe sewn to the bottom edge. The fringe stands out better if sewn ON the velveteen as high up as the width of the fringe, and NOT allow it to hang over the bottom edge.

THE FRINGE

The fringe can be gold or silver, the latter being considered the most effective. Three silver bullion stars can now be placed on the front of the drape as shown in the illustration, and the top is complete, except for traps and servantes; these I do not propose to discuss in these pages, because they are used by professional magicians, and I do not want to expose to all and sundry these aids to conjuring. If you are particularly interested in these, however, I will give you further particulars if you drop me a note.

The next thing to consider is the kind of tripod or legs for the table. A turned wooden single leg is pleasing in appearance, and can be made to screw into a metal fitting fixed to the underneath side of the top. Another handy and convenient support is a heavyweight music-stand tripod. This can be made to screw into a fitting already screwed to the top.

Besides being light, it folds up easily and will fit into a small-size suitcase. The tripod should be painted gold in color, or if you use the turned wooden leg it may be painted black and gold according to taste.

Magic stores and depots stock suitable tables and accessories, and they are not expensive to buy. For the magic enthusiast who wants to make his own, the instructions herein should suffice. There are many other kinds of tables, of course, but the one outlined here will be found most useful to the average amateur.

There is another table that can be made to fold into a little carrying case of about 7 x 8 x 16 inches, covered with imitation leather, metal corners, lock and key, and handle. The case when opened attaches to the table base, making a box top. The case itself is actually the table when set up. The legs, drapes and all folding nicely down for packing.

HEY PRESTO!

Hey Presto!

Abracadabra!

I do not think there has been a time in the history of Australia, when so many things of magical interest have happened at the one time.

In previous issues of "Radio & Hobbies" I told you about the several moving pictures giving prominence to magic and magicians. Still another great picture was released during the month, in Sydney and Melbourne, of considerable interest to magicians. The picture is "Miracles for Sale"—see it by all means.

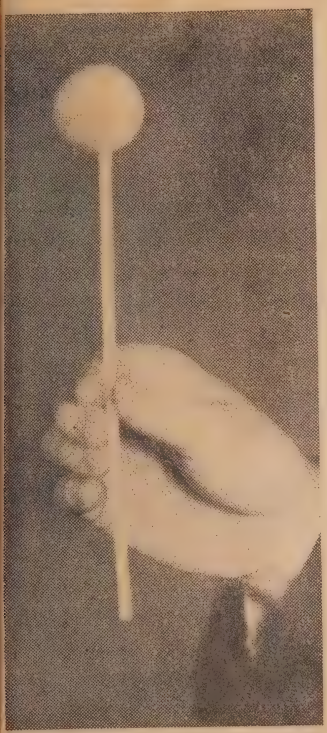
Many readers sent letters asking for much information about different phases of magic. One asked about the arrangement of suitable "patter," another asked for chemical tricks, others want penfriends, several sent their photographs and programmes, whilst one or two wanted to know how to earn money by magic. All kinds of questions have been received. Judging from the questions received, I intend to write short articles of general interest about these certain points, from time to time. Still, if there is anything you want to know in addition to this, do not fail to drop me a line and ENCLOSE A SELF-ADDRESSED AND STAMPED ENVELOPE FOR REPLY. Address your letters to me, C/o "Radio & Hobbies," 60-70 Elizabeth Street, Sydney, N.S.W.

I want to thank those of you who sent in a number of puzzles and tricks. Many of these will be used as opportunity offers. Many received were too long in their explanation, and were otherwise unsuitable for these pages. Again, I want to say to those who ask about ventriloquism, it is NOT difficult to learn this fascinating art if you are prepared to give a little regular practice to this interesting section of magic. If you experience difficulty, drop me a line saying briefly where you have the trouble. Good dialogue for you and the doll is an essential part of the ventriloquist's art.

With best wishes. Yours for better magic.

Barry Kent

ALL AND STRAW BALANCE



This feat appears extremely difficult, yet it is quite easy to do. You hold a drinking straw in your hand and balance a small rubber ball upon it.

HOW. An ordinary pin in the rubber ball is inserted in the straw. Keep the pin out of sight—at the rear side of the ball away from view of the audience. This makes the balance easy. Drop the pin to the floor at the finish of the trick.

WHO'S WHO IN MAGIC

THIS month we are pleased to announce the name of SYD SMITH, the clever London performer, who won the Shield Competition at the recent English Magical Convention. The British Ring of the International Brotherhood of Magicians, usually referred to as the I.B.M., held their ninth Annual Convention at Southport. The success of the gathering was outstanding in every way.

Syd Smith in addition to winning the Shield with a superlative magic act, is also the proud father of London's young magicienne, Daphne, whose photograph appeared in our September issue of 1939. Daphne was then only seven years of age, and astounded over 400 English magicians with her magic and mystery.

Syd Smith looks longingly to Australia, and we have little doubt that as soon as he can arrange it, he will make his way here. He will receive a mighty welcome from Australian magicians. At present he is engaged as an Air Raid Precaution warden, and as a result his planning to visit us must be held in abeyance indefinitely.

His act of magic is spoken of in the highest terms. For the Shield Competition, he opened with a silver pistol, card productions with handkerchiefs, walking stick vanishes and turns into red handkerchief, more card fans, double fans, diminishing cards in fans, vanishes, self-opening cigarette case, a little comedy, and to finish the cigarettes change to a cigar and the cigar to a pipe. A nice, smooth-working act presented with manipulative ability, showmanship and high entertainment value.

Sydney Smith

Australia would like to see you, Mr. Smith and Daphne.

We say "WELCOME" to you both.

THE JUMPING CARD

A SELECTED playing card is pushed into the pack of cards, and at the magician's command the chosen card jumps from the pack and flies high into the air.

HOW: Prepare two cards with a rubber band between them, leaving about two inches of elastic between the cards. Tie the ends of the elastic in knots and allow these to fit into slits at the top of the two prepared cards. These are placed in the centre of the pack. Now push the chosen card between them, and press the bottom of the pack holding the selected card. With a sudden release, the selected card will jump high into the air.

How the trick is done. With a little practice it can be made very effective.

THANKS, MAGICIANS

HERE are two problems sent in by Magician readers. See if you can solve them.

Answers will be published in our next issue.

Sent in by Norman Hooper:

Two boys playing on a roof fell down a chimney. One boy was covered in soot, but the other was quite clean. The clean one went and washed himself, but the dirty boy did not. Why was this?

Sent in by Hartley Newell:

Problem: There were two boys—one big and one small. A shilling was to be divided between them so that the big boy would receive 1½d more than the other. What amounts did they each receive?

ANSWERS WILL BE PUBLISHED NEXT MONTH.

THROW YOUR VOICE

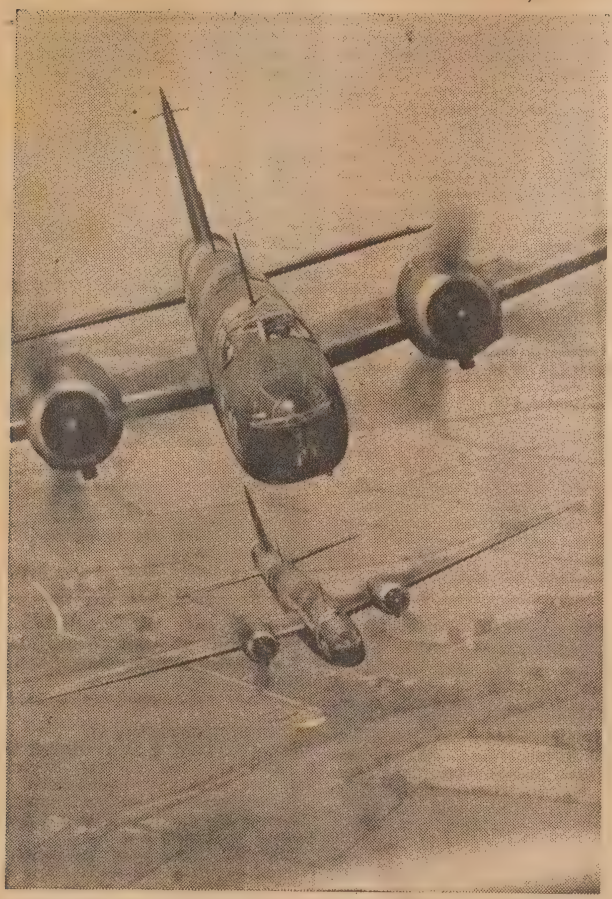
into a trunk, under the bed—anywhere.

THE VENTRILO

An instrument fits into the mouth, cannot be detected. With the aid of this Double throat or VENTRILO you can imitate birds, animals, etc. Everything for ONE SHILLING, including a FREE booklet giving you full instructions how to become a Ventriloquist and throw your voice.

Will Andrade 173 PITT ST., SYDNEY. 52 Swanston St., Melbourne.

CANNON ARMAMENTS FOR ALLIED PLANES



Left—
A Vickers-Wellington bomber at close range. Such machines now carry cannons as supplementary arms to the multiple machine guns.

Fighting planes continue to hold front place in the news of the war in Europe. The days of fragile wooden machines firing a single machine-gun through the propeller blades are gone long ago. Now we use multiple machine guns and, the latest development of all—small cannon firing regular shells. This article tells you something of this new arm for fighting planes.

OVER the past few years the development of fighting aircraft has been tremendous. Speed and range have reached limits previously thought impossible, and hand in hand with these developments has gone the development of aerial armament.

As always, machine-guns have been considered of prime importance, at least as far as British aircraft are concerned. At the same time there is a great difference between the fighters of the Great War firing one or two guns through the propeller, and modern Hawker Hurricanes and Supermarine Spitfires equipped with eight Browning machine-guns nestling in the leading edge of the wing.

Britain has concentrated on these fast, mobile fighters as a first line of defence. They are essentially designed for aerial combat. Their purpose is to engage, harass and destroy attacking enemy aircraft, and their armament has been developed along those lines.

At the same time bombing machines have developed to such an extent that they can withstand prolonged machine-gun fire. All-metal structure and armor-plating has to a great extent lessened the effectiveness of machine-guns. It is possible for a large bomber to carry on even when riddled by machine-gun bullets, that is, of course, provided vulnerable spots such as petrol tanks and controls have not been struck.

THE LIGHTWEIGHT CANNON

All this has led to the introduction of a new weapon, the light-weight cannon. Equipped with a bore of 20 m.m. or 37 m.m., these guns are capable of firing shells up to 1½lb. in weight and carrying a variety of ammunition, including a high-explosive charge, capable of blasting a hole many feet in diameter in an aeroplane wing or fuselage. It does not require a great deal of imagination to conceive the effect of such a shell striking the engine of an enemy plane. In fact, any direct hit with such a weapon should cripple, if not entirely wreck, the machine.

At the same time the question is not one of simply manufacturing these guns and fitting them to existing aircraft. There were and there still are problems to be overcome. Not the least of these problems was recoil.

LATEST GUNS SECRET

Of course, much has been done to remedy early difficulties, and just how far these guns have been developed at present is quite impossible to know. The normal secrecy which attends these experiments is increased a hundredfold during war time. However, we can trace the development of these guns

By

JOHN CAVILL

· the past few years, and thereby
an impression of the present status
he aerial cannon.

ack in 1934 the British Air Ministry
duced a flying boat designed to at-
submarines. It was the Blackburn
ch and was equipped with a 37 m.m.
non. It fired a hundred rounds per
ute, and could be aimed with accur-
over a distance of 1500 yards. The
problem with this gun was, how-
, the recoil. It is reported to have
n equal to 1600 pounds, which great-
retracted from the value of the

year later the Fairey Fantome ap-
red equipped with a moteur-cannon.
s was a 20 m.m. gun, which fired
ough the propeller hub. Actually
t into the engine, there was no ap-
ciable recoil from the moteur-can-
, and it was capable of firing be-
en two and three hundred rounds
minute of 1lb. shells.

here was one catch with these 20
n. guns, and a very important one
far as the flying crew were con-
ned. The shells fired from these
ns are not reliable, and they are
te likely to explode before they leave
barrel of the gun—i.e., they are not
e-safe.

NGE OF 2000 FEET, PLUS!

n the last year 37 m.m. guns have
ched a high state of perfection. They
now firing shells which are bore-
e and have even greater destructive
wers than previously. Effective range
s been reduced to around 2000 feet on
aller guns, but a larger type with
barrel around six feet in length and
signed for use on large bombers, can
im nearly double this distance. In-
entally, the latter gun is reported to
ve a muzzle velocity approaching
00 feet a second.

At the same time these guns have not
splaced the machine-guns, but rather
gmented them. As we mentioned be-
re, Britain is still relying on Brown-
g machine-guns for her small inter-
ptor fighters.

ASE FOR MACHINE GUN

The reasons should be fairly obvious,
r, although the machine-gun has a
nge of around 200 to 250 feet, while the
nnon has ten times the range, the
rger guns are more cumbersome, and
ext to useless in close fighting. Machine-
ns, on the other hand, aimed by
inting the plane, are capable of short,
curate bursts, and when eight of such
eapons are synchronised, a really
ithering burst of fire is set up.

However, Britain, having done so
uch experimental work, is not allow-
ng the 37 m.m. gun to fade out. Far
om it. Mass production factories are
ow turning them out as fast as they
an, and they are being fitted to all
he larger machines. The new Hawker
otspurs will carry these cannons both
ore and aft, in addition to formidable
achine-gun armament.

France has not been backward in fit-
ing her planes with these guns. Both
0 m.m. and 37 m.m. types are stand-
rd equipment. A 20 m.m. gun firing
hrough the hub of an Hispano-Suiza engine is France's best bet, and is capable of firing nearly 300 rounds per minute of 1lb. shells.

NEW FRENCH PLANE

The new French Amiot 44, a medium bomber type, which can also be a formidable fighter, is equipped with four guns. Two in the nose, one on the top of the fuselage, and one in a special gun turret in the bottom of the fuselage. In addition, a bomb load is carried, and a cameraman for observation work.

As we mentioned before, it is impossible to keep tab on latest developments. It may be that even now weapons as large as 75 m.m. are being produced.

Even in 1934 the French produced a 75 m.m. gun, which could be used on large planes. Since then, nothing has been heard of this gun, capable of firing a 3in. shell, the destructive power of which leaves one gasping. Such a shell should be capable of practically disintegrating enemy aircraft.

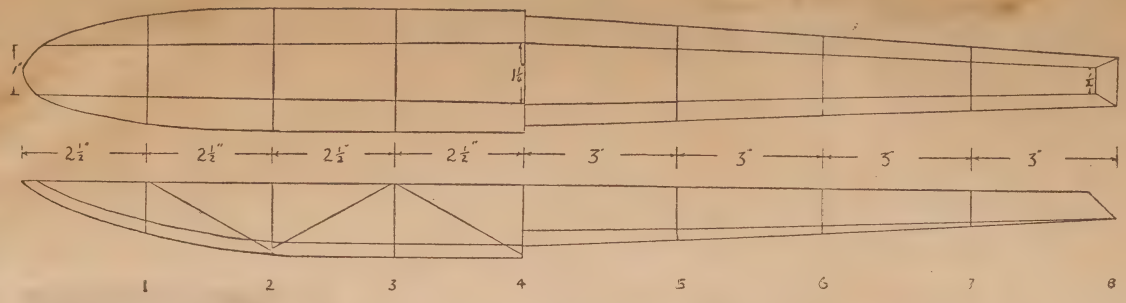
USE OF ARMOR PLATE

The only answer to these new weapons seems to be in some new armor-plate. In America an armor-plate, consisting of aluminium sheet sandwiched between two sheets of steel, is being tested.

The difficulty is to obtain a light-weight armor-plate. In land defence, weight is of little or no consequence, but the aircraft must be light enough to fly, no matter how heavily armored it is.

The effect of these cannon on aircraft structure and design may be very far-reaching. At present it is purely a matter of conjecture, but this much is certain, if the cannon live up to the promise they show, then the military aircraft which emerges from this war will be vastly different from that which enters it.

A marvellous picture of a Hawker Hurricane on the tails of its quarry. In such a position, the machine guns would probably be most effective.



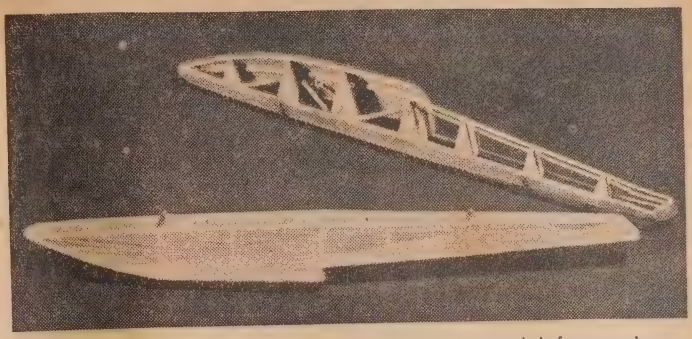
ALL FORMERS NOTCHED FOR STRINGERS

ALL FORMERS DRAWN EXACT SIZE.

CUT FROM 1/16 BALSA

MAKING FLOATS FOR R.O.W. PLANES

BUILT TO WAKEFIELD SPECIFICATIONS



A pair of floats—one covered and one showing the framework before covering.

The "dyed-in-the-wool" model plane enthusiast will not be content until he has tried his hand at something outside the normal bounds of design. Models which rise from the water are fascinating and instructive, and can be made to perform quite successfully.

SUCCESSFUL R.O.W. flying depends primarily on the floats.

These floats have been designed for a model built to Wakefield specifications, and the plans are drawn to that size. However, this basic design can be adapted for a model of any size.

The size shown here is 22in., for a model with a fuselage around three feet in length. For a fuselage around 25 or 26 inches the floats should be reduced to 15in. in length, with other dimensions scaled down in proportion.

CONSTRUCTION

The features of the construction are shown in the photograph. The top of the float is a sheet of 1-16 inch balsa. Cut to the shape shown on the plan. The sheet is 21½in. long. The greatest width is 10in. from the nose. Here the sheet is 1¼in. wide, and from here it tapers to 1in. at the nose (note how the nose is rounded), and to ¼in. at the tail. The sides of the sheet are straight lines so that it can quite easily be drawn straight on to the wood.

It is most important that both floats be made simultaneously. Formers should be cut in pairs, and two copies of the top sheet should be made at the same time. Here we will describe the manner of making one float. The procedure for its mate is, of course, identical, and, if each step is duplicated and both floats built at the same time, they will be truly identical. This will save many headaches when the time comes to fly the model.

THE FORMERS

Having constructed the top, or what is actually the backbone, of the model, the position of the formers should be marked, and then the formers cut out.

Cut the formers from rigid 1-16 sheet balsa. Choose the wood carefully. It should be reasonably light, but quite firm. A mottled grain indicates rigid wood; in any case, it is easy to test the wood with the fingers. Incidentally, when we mention mottled grain we are referring to the grain alone; this should not be confused with a speckled wood discolored by water stains. The mottled effect refers rather to the surface of the wood and the manner in which it reflects light.

With the formers cut to shape, sanded, and slotted for longerons, take the top sheet and cement each former in place. They should be cemented vertically, with the exception of the last former, which is set at a 45 degrees angle. When they are thoroughly dry, cement the longerons into place; they are made from 1-8 square balsa.

BRACING

Supporting braces are fitted between the front formers, 1-8 square balsa is used, and their position is shown on the plan.

The number 4 former marks the position of the step. Cement 1-8 square strips on this former, as shown in the plan.

Cover the front bottom section with light 1-16 sheet balsa, and sand down to 1-32in. thickness.

Cement aluminium tubes, to take the landing gear struts, immediately above formers 2 and 6. These should be very firmly fixed, and should be in place before the paper covering is applied.

Finally, cover the whole with a good grade tissue and dope. Do not use paste to attach the paper; acetone cement is the best adhesive. Go carefully over each float and seal every join.

A preliminary coat of dope is applied to tighten the covering, and then several coats of banana oil make the float perfectly water-tight, without tightening the covering.

For salt water, banana oil is essential; otherwise, dope may be used. Be careful, however, not to use too much dope, as this may distort the framework.

When the whole job has thoroughly dried, test it to see that it is really water-tight; if any leaks show up, acetone cement should again be applied.

The floats are now ready to be tried out. Fix them rigidly to the model—a floppy under-carriage will completely ruin any R.O.W. flight—mount them an inch or so ahead of the propeller, and the rest is up to the stop-watch.

INCIDENCE OF ATTACK

MODEL builders are often confused by the terms angle of incidence and angle of attack. They refer to two totally different measurements. The angle of incidence refers to the angle the wing is set to some fixed datum line, usually the thrust line. This angle is predetermined and does not vary during flight.

The angle of attack on the other hand, is the angle between the wing and the airstream. Thus the angle of attack would vary constantly during flight, increasing as the model climbs and decreasing as it noses down.

A wing may be set at 3 degrees incidence and have an angle of attack as great as 15 or 16 degrees during flight. A high angle of attack will cause the model to stall irrespective of the incidence.

* * *

USE methylated spirits instead of water to tighten wing covering. The spirit dries in a few minutes and dope can be applied without any danger of blushing. Never mix water with methylated spirit, it will streak your paper and ruin the appearance of the job.

Eric Marden, who won the cup with a flight of 6min. 15sec.

Arthur Butler reaches for the pieces after his model crashed!

Eric Cocks, of Lakemba, came third.

E. Donaldson, of Leichhardt, weighs in his "Korda." It was placed second.

ILLAWARRA CONTEST

Patchy flying characterised the model plane meet at Illawarra on March 17. Conditions were bad, and the winner's time must be taken as very gratifying. Eric Marden proved the winner, thus repeating his recent success at Bondi.

A clean, straightforward design by John Finch, of Chatswood.

ILLAWARRA CUP CONTEST

Won With One-Blade Propeller

In February, Eric Marden, of Bondi, won a novice contest with 5min. 17sec. On the same day he set a new duration figure of 35 minutes. Just to prove that this wasn't an accident he won the Illawarra Cup on March 17, with the time of 6min. 15sec.

MARDEN was flying a modified version of the Grant "Tse Tse Fly," incorporating a one-bladed folding propeller. The weight the model was exactly 8oz.

Weather conditions for the Illawarra ntest were very bad indeed. A very isty wind blew most of the morning id the sky was overcast. Many of the odels had been built especially for is contest and had not been thorough- test flown. This, added to the bad eather, resulted in many crashes.

PECTACULAR CRASHES

The most spectacular crash was exe- uted by a Leichhardt model. This achine, a "Korda," climbed well in he gusty air, but suddenly stalled and ent into a power-spin. The strain f this manoeuvre was so great that he wing folded when the model was some twenty feet above the ground. The result was a complete wreck.

The contest started slowly. The first flights were mainly crashes, and no one seemed anxious to try and beat the weather. At last Eric Cocks; of the "Bats," sent his model up, and took the lead with 1min. 14sec. Eric was flying the model which won this contest last year. However, 1min. 14sec. did not remain in front for long.

Arthur Butler, of Leichhardt, raised it to 1min. 18sec., and then almost immediately his club mate, E. Donaldson, sent his Korda up to record 1min. 49 2-5sec.

WINNING TIME

This time remained on top most of the morning. Cocks reached 1min. 46sec, but could not improve. It looked as though these times would be the best, then on the second last flight of the day Marden caught one of the few thermals of the day and recorded 6min. 15sec, and took the cup.

John French, of Chatswood, caught the same current, but with his usual luck had the rubber motor bunch in the nose, and ruined the glide of his model. French was flying a well designed Wakefield model, which he brought to the field completely untried. It survived the preliminary test flights —on this day they were test crashes— and shows a great deal of promise.

Two or three all-balsa fuselages were being flown, and generally the trend was to more streamlining. Roy Cornish, of Chatswood, was flying a very neatly built all-balsa design, but he, too, had trouble with the elements.

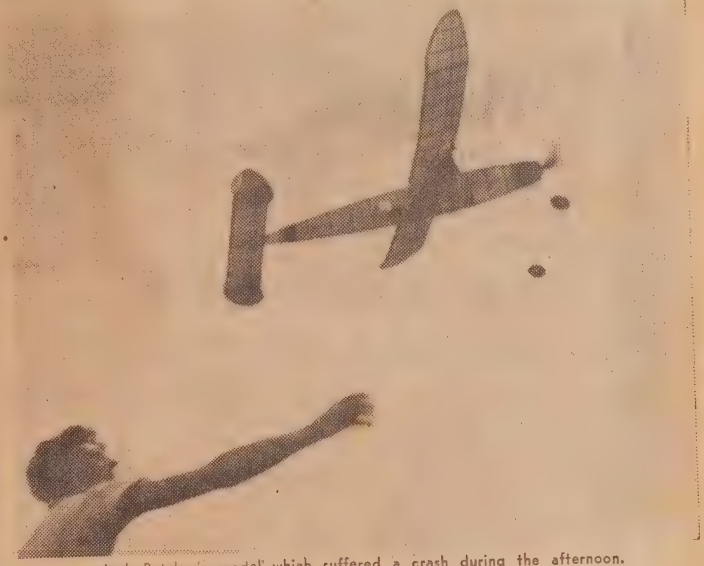
Eric Cocks had a new machine of quite unusual design. The fuselage was diamond shape, and covered with sheet balsa, the section being built up square where the wing sits. The structural work was particularly light for its strength. The bare model without rubber, weighed less than four ounces. Cocks only flew this model once. It had the usual vertical climb we associate with Eric's models, and it handled the weather well, but there was a slight stall present which wasted most of the power.

Jack Butcher, of the "Bats," was the only flier we saw who went to the trouble of rebuilding his model after a nasty crash.

The Illawarra Cup contest provides an opportunity to test Wakefield models under competition conditions, and to prepare them for the Wakefield elimination contest held in April each year.

CONTEST SUSPENDED

From the eliminations the models are selected to represent Australia in the International Wakefield contest. We learn, however, that the International contest has been suspended for the duration of the war, and until that time the cup will remain in America. The M.A.A. are still going to hold the elimination contest as scheduled on April 14 to discover the 1940 Wakefield champion.



Jack Butcher's model which suffered a crash during the afternoon.

YOU WILL BE PROUD OF THESE MACHINES.
SEND OR CALL RIGHT AWAY!

THE
"BROWN JNR."
17in. WING SPAN.
READY TO FLY.
Price 6/6. Post 1/6 N.S.W.
KIT TO BUILD IT.
Price 4/6. Post 1/- N.S.W.
And
Our No. 1 Prize Model Winner I
Guaranteed to Fly.

THE
WALTHER "PEP"
This machine is of the latest type, with solid balsa sides and nose and paper covered wing. Fully doped and lacquered.
READY TO FLY.
Price 9/9. Post 1/6 N.S.W.
KIT TO BUILD IT.
Price 7/3. Post 1/- N.S.W.

WALTHER & STEVENSON
PTY. LTD.
395 GEORGE ST. SYDNEY

100% TECHNICAL RADIO!

BIGGER & BETTER

The instantaneous success of the first issue produced under the direction of our NEW EDITOR means more than merely adding to his already world-wide reputation. It means that we can now afford to add extra pages, more features and even better articles.

THE APRIL ISSUE

of the Australasian Radio World

which will be on sale April 8, is again packed with outstanding TECHNICAL articles, including the following circuit designs:—

- "BIG BOY"—super-power amplifier.
- "ATOM"—crystal circuit.
- "JUNIOR"—short-wave converter.
- "BABY GRAND"—fidelity amplifier.
- "BEDSIDE TWO"—for headphones.
- "1940 SCOUT"—t.r.f. battery set.

AND

- Two portable receiver designs.

All the regular features too, including Alf. Barnes' JUNIOR TECHNICAL SECTION.

PRIZES

to the value of

£100

are expected for the

AMPLIFIER CHAMPIONSHIP OF N.S.W.

Further details of this remarkable competition are given in this month's issue.

Get YOUR amplifier ready!

SECURE YOUR COPY NOW of THE AUSTRALASIAN RADIO WORLD

ON SALE APRIL 8

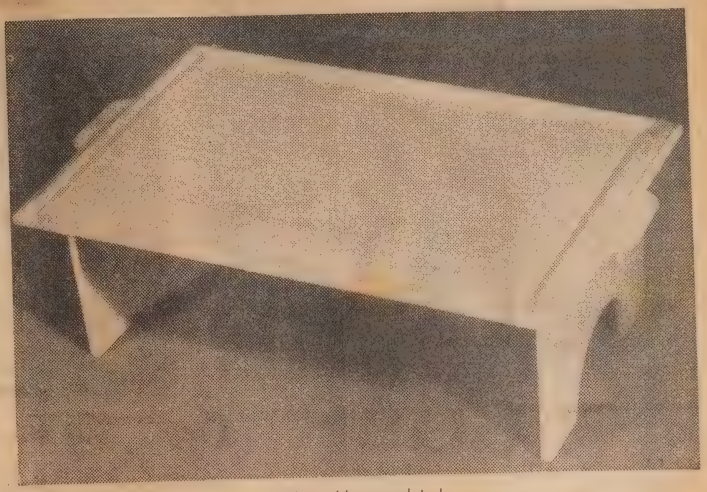
at all bookstalls and newsagents and direct from

THE PUBLISHER

119 Reservoir Street, Sydney. FL2842.

MAKING A SIMPLE TABLE FOR THE SICK BED

Here is an easy-to-make article which has many other uses other than its original. It will be invaluable should a member of the household be confined to bed. And then, who doesn't like breakfast in bed occasionally? Full dimensions and constructional details are given.



The table completed.

By A. D. GORFAIN

HERE is an easy-to-make project that can be put together by a handy-man in a couple of hours, and when finished will be a valuable accessory in any home. There are few families that do not have somebody spending a few days in bed occasionally, and when that happens, this table will be a good friend.

Meals may be served on it and carried into the sick-room. It also can be used for dominoes, cards, jig-saw puzzles and for the support of large, heavy books. While being used it enables the person in bed plenty of freedom to change positions.

With the exception of the border and metal brackets, it can all be made from a piece of timber 37in. x 14in. x 3-8in. Cut out the top and the two supports as shown in the diagram. A fret-saw or keyhole saw will get you over those two curved cuts. Put two right-angled metal brackets on the supports and attach them on the underside of the tray, an inch in from and parallel to the tray edges. Use 3-8in. screws, so that with the brackets they will not come through the tray surface.

The two finger-grips can now be made and two holes drilled through each, so that 5-8in. screws will also hold them underneath the tray. Countersink these holes before the screws are made fast.

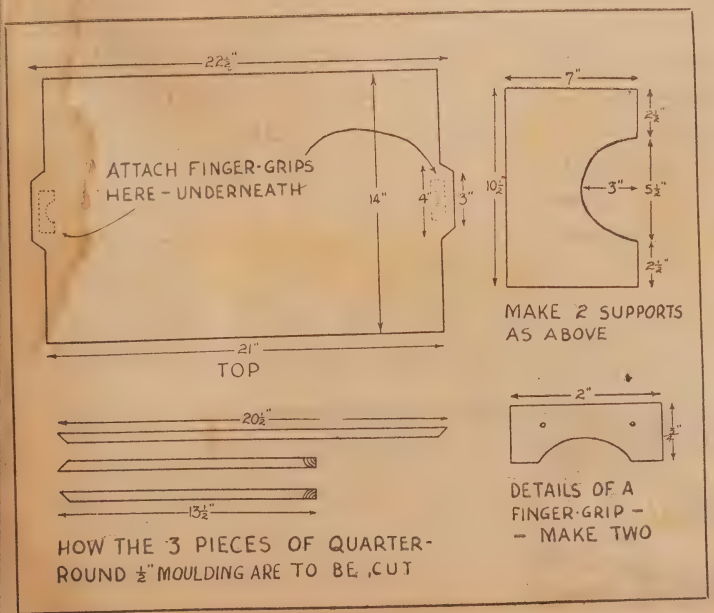
FINISHING THE JOB

Now get a 4ft. strip of quarter-round ¼in. wooden moulding and cut it into the three pieces as shown. You'll notice that the border only goes around three sides. The outer edge of the moulding is to be ¼in. in from the edge of the tray. For the two right-angle joints a mitre-box will come in very handy. The curved edge of the moulding goes on the outside.

You may glue the border in position or attach it with 5-8in. screws from underneath. Use four on the largest piece and three on each of the other two.

Sandpaper it all over, first with medium, then with fine, and then two good coats of cream enamel all over will finish your bed table.

You'll now probably find yourself wishing that somebody in the family would get a cold and be confined to bed for a couple of days. You'd better not, it may be yourself!



HOW TO MAKE YOUR OWN LINO-CUTS

A deep firm cut is obtained by steadying one hand with the other.

This method of cutting is more flexible than that shown at the left.

Here is an article which tells you something about a rather unusual hobby. Lino cuts have an advantage in that even the novice can produce quite good designs while the artist may create a masterpiece. Here you will read how to start making lino cuts for yourself.

By CHARLES CUNNINGHAM

BY this method you may produce your own book plates, greeting cards, party place cards or even carry out work on a commercial scale. With practice and patience some delightful and highly artistic effects may be obtained.

Follow directions for the production of book plates. You will need a piece of linoleum about four inches square and a quarter of an inch thick, a really sharp pocket knife, a U-shaped and a V-shaped gouge, and a block of wood the same size as your lino. block, and about one inch in thickness.

If you are using ply wood you can glue your lino. to it, but if deal is used it is better to cut your design in the lino. first, and then tack to wood in the cut out places with very small carpet tacks. Some prefer to have wood block larger than lino. cut, and cut a tacking selvedge all round the block.

CUTTING GOUGES

Gouges can be bought from the art department of any big store, or you can make them yourself by filing down reversed pen nibs. Gouges, however, must be sharp, and it is best to buy the proper tools.

When creating or selecting a design, choose a bold subject at first as examples given here. Design should be in silhouette, poster style, houses, trees, flowers, ships, scenes in simple lines, these things are best. For ideas look through old Christmas cards, and in books and magazines.

Choosing a design of suitable size, trace it on thin transparent paper. Now take a sheet of fresh carbon and place it, face down, on top of your linoleum.

Next place tracing over carbon and go over lines carefully with the end of a knitting needle or a sharp-pointed pencil, thus transferring your design to the lino. block. Remove design sheet and carbon sheet, and, with Indian ink of waterproof drawing ink, go over the design on the lino. with a pen, afterwards filing in solids with a small, soft brush dipped in the same ink.

Your design, which you have filled in with ink, is the part you want to print, so all other lino. must be cut away or gouged out to about half its thickness or depth.

Before cutting, wait till the ink is dry. Then warm your lino. Don't make it hot. It will cut cleaner warm than cold. First, with a pen-knife, cut a shallow V-shaped channel or groove right round your design.

Don't cut too deep. Go slowly and cut cleanly so that no rough edges are left to blur your finished prints. After channelling, cut away all the rest of the linoleum surface not included in the design. Where lettering is included in the design, extra care must be exercised. The gouges should be used to finish off the fine details. Make a good job of this finishing, and your block is ready to print.

For the production of a good job partially absorbent papers are best. Don't use anything with a glossy surface. Fine grade linen, note or lightweight water-color papers are good. You may also print on cloth.

Pongee and thin unbleached muslin

A group of gouges and a handle. The gouges fit just like pen nibs.

Two typical designs of a type very suitable for lino cutting. You will soon be able to work them out for yourselves.

re best, but other smooth materials lo very well. For printing, use show-ard or oil paints, or printers' inks in ny color, but mixed to the right con-istency. You want a glass or marble lab (a piece of the top of an old wash-stand is fine). Smear a small quantity of paint or ink on the slab.

If you have to thin it, break it down with turpentine until it is like a thick paste or thin cream. Be sure your color harmonises with the color of your paper. You may paint the color thinly on your block with a brush, making all strokes in the one direction, but what you really need is a small printer's roller. If you can't buy one, make a substitute by covering a rolling-pin with several thicknesses of cotton gauze. Spread the ink or paint thinly on the slab, run the roller over it and then over the face of the block.

Have your paper or card on cloth to be printed, cut to size and lying face up on a thick pad of folded newspapers. Dampen the surface with a cloth, and then place your block face down, on the damp surface. Hold firmly for a few moments, then remove carefully and inspect your impression. This is your first proof, and will show whether your block is cut deep enough, &c., and if your ink is mixed correctly.

You may take any number of prints in this way, inking the block every time, but, for large quantities, you should make or buy a small printing frame.

COLOR PRINTS

If you want your print to carry two or more colors, one method is to cut away all but the bare outlines of the design and fill in, by hand, the colors chosen, using a small soft brush. For a cloth, use vegetable dye; for paper, water-color paints. Keep the best samples of every job you do. Take lino. cutting seriously, and you will be amazed at your progress. Remember before putting slab, roller and block away, always clean them thoroughly with a cloth dipped in benzine.

SCIENCE OF THE SIEGE GUNNER

Continued from Page 7

The path of every projectile is a beautiful curve, known as a parabola, and no projectile follows a straight line at any part of its flight.

The spin given to it by the rifling in the gun causes it to drift out of a direct line, to the right of the target, so the gunner has actually to lay his gun to the left of the work he is out to destroy, if he is going to hit it. And even then he cannot be sure (see the centre drawings) that he will hit it more than five times out of one hundred.

Howitzers are laid on their targets first by taking compass bearings, but there are many things to take into account. The shell travels high into the air, may be several thousand feet, and the wind it meets must be allowed for, also the density of the air, and its temperature; these have an important bearing on the accuracy of fire.

Enormous pressures are set up in the chamber of the gun, and in an eight-inch howitzer, firing a shell weighing 200lb., this may amount to no less than 30,000lb. to the square inch!

The drawing at the top shows details of the flight of the shell. The angle of elevation is the tilt that has to be put on the gun to ensure the full distance being carried by the shell, the range is the exact distance between gun and target, but the distance travelled by the shell is much greater than this.

ARTIFICIAL LARYNX

Continued from Page 13.

made by hand which restores to them the divine gift of speech, song, laughter and happiness. . . ."

Then the film demonstrated the miracle machine itself. I must confess I have never in my life seen such a wonderful apparatus, the fruit of a great human idea. First of all, we have to know that there are two groups of dumb people—those who are born dumb and those who have lost the faculty of speech as the result of an operation. The apparatus can help both these two groups of dumb people.

By means of a slight operation the lungs are entirely disconnected from the mouth and the throat, and the trachea (windpipe) is terminated by a small opening at the base of the throat. Breathing and speech take place through the opening.

During normal speech air is expelled from the lungs and passes through the trachea to the larynx, which contains vocal chords which, when thrown into vibration by the current of air from the lungs, convert it into a train of sound waves. This train passes into the cavities of the throat, mouth and nose, where it is transformed into speech.

Examining the functioning of an artificial larynx, this is the process that takes place. The sound is introduced externally into the mouth through a flexible tube. The air current from the lungs is converted into sound waves by a metal reed which is enclosed in the sound box provided. The user of the artificial larynx performs a series of slow motions and adjustments similar to those used by a person speaking under normal conditions.

After looking at the film, I realised that through this great discovery science has presented the whole of mankind with a wonderful gift, as the artificial larynx is sold direct to people who need it without any profits. This was proved by the firm's accounts, which were openly submitted to my scrutiny. Science in the cause of humanity is going to help the suffering human body.

STRANGE EUROPEAN ON 41-METRE BAND

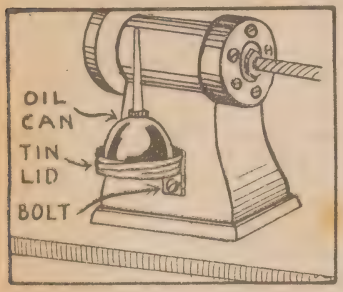
DURING the last two weeks there has been a strange station on 7240kc., 41.42m., heard from as early as 5 a.m. with talks in German, French, and other languages. At 6.45 a.m. a talk by a lady is given in some Scandinavian tongue, when she announces as "Radio Nacional," Paris, or at least it sounds like Paris, and we are inclined to think it is as they often mention some of the French broadcast band stations such as Radio Tours, Radio Toulouse, Lille PTT, &c. Closes at 7 a.m. and then usually opens at 7.10 a.m. There is a great similarity between this station and the one which was on 31.36m. a few weeks ago, announcing as Radio Czechoslovensko, though the 41-metre band station never gives the latter call. Will readers please try to find out any definite information re this newcomer?

HINTS FOR YOUR WORKSHOP

By Walter G. Nichols

OIL CAN HOLDER

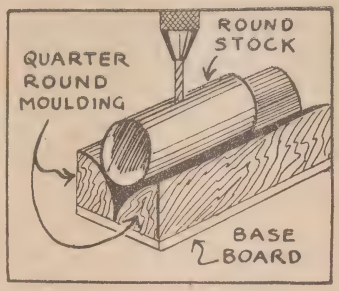
AN oil can is usually wanted around a lathe, but when the lathe is in operation the oil can usually moves across the bench with the vibrations and finally falls on the floor. A handy



non-skid holder can easily be made from a tin lid taken from a disused jar, making sure the lid is large enough to hold the oil can. A small strip of brass is soldered to one side of the lid to allow fastening to a convenient part of the lathe by means of a small brass bolt tapped into the lathe, as per sketch.

EMERGENCY "V" BLOCKS

"V" BLOCKS are very useful jigs to have about for holding round stock steady when drilling and for many other operations. If you have no regular "V" blocks on hand, a pair can be quickly improvised by using a strip of ordinary quarter-round moulding sawn

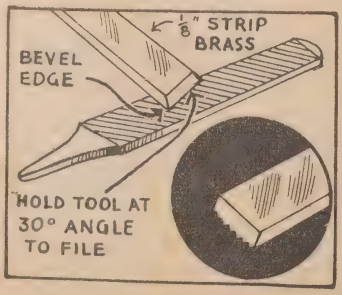


into the lengths desired and screwed or glued to wooden bases. Apply two lengths of the moulding to each base piece so as to have a "V" shaped piece through the middle, as shown in the illustration. These blocks are strong enough to stand up to hard usage.

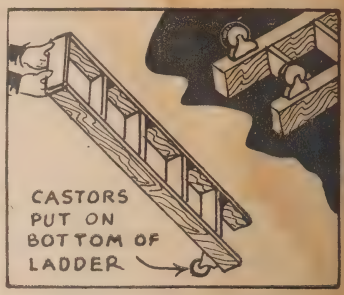
* * *

HANDY FILE CLEANER

WHEN working soft metal you usually find that the file clogs very quickly. If a stiff wire brush is not available, a small piece of brass or iron stock will do the job just as well. When the brass is rubbed over the file the teeth



quickly cut grooves in it, thereby pushing out the accumulated metal. The piece of scrap brass should be about 6 inches long by 1 inch by ⅛. One end should be bevelled to a 30 degree angle.



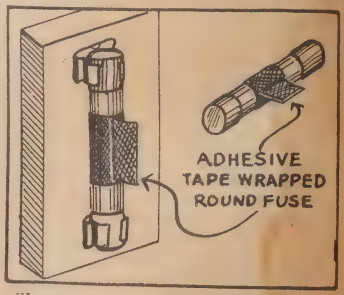
MAKE YOUR LADDER PORTABLE

A PAIR of ordinary bed casters screwed to the bottom end of your ladder, as shown in accompanying sketch, will eliminate dragging the ladder from one room to another. When the ladder is in an upright position for use the casters will be just clear of the floor, thus preventing the ladder from slipping when on the job.

* * *

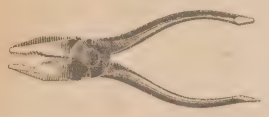
FUSE REMOVER

IF your workshop fuse is of the cartridge type and tucked into some out-of-the-way spot, the following hint



will save you from scraping the skin off your knuckles when replacing a fuse. Place a piece of adhesive tape around the fuse, allowing the two ends to form a tab, which should be firmly pulled to remove the fuse.

Crescent
UNIVERSAL CUTTING PLYER



Has flat nose, with teeth for gripping—keen side cutter—pipe grip in nose—reamer and screwdriver at ends of handles.

Gun metal finish with polished head.

	6in.	7in.	8in.
Price ..	7/3	8/-	8/6

RECORD PLOUGH PLANE, 043
Price 14/6

MILLERS FALLS PISTOL GRIP HACKSAW, with blade .. 4/9

NOCK & KIRBY LTD.
Pioneers of NHRT
GEORGE ST. SYDNEY

We Manufacture

GENEMOTORS
Low to High Tension up to 35 Watts output.

SOLENOIDS for Industrial Use.
TRANSFORMERS & CHOKES.

G. COLTON
59 ERSKINE STREET, SYDNEY.
B3510.

RADIO KEEPS YOUR LAMPS ALIGHT

(Continued from Page 6)

orted by radio that all was O.K. in at 7.38."

On February 2 a report was received m a garage in Ryde that the electric ply had failed, and that the car- st could not be lowered. Complaints- icer Sheppard, on his way from Ryde Burwood, was called to attend. He ched the job a few minutes later, d 10 minutes after the call had been eived the hoist had been lowered, d the holiday party in the car were e to proceed on their trip."

The following item is a good indica- n of what can be accomplished: At 0 p.m. on November 21 a fault was orted at Pymble sub-station. The erator at VKK calls District Operator vies, who was at Chatswood, and in- ucts him to go to Pymble sub-station. hilst he is on his way a report is ceived regarding an explosion at a ansformer in Birdwood-avenue, Kil- ra. Davies is called again, and he oceeds to this point. In the meantime, istrict Operator Keogh, who is pass- g over the Harbor Bridge, on his way Mosman, is also called and instructed assist. Mains Foreman Glover, at hatswood, is also informed, so that pair work may be expedited.

At 3.25 p.m. Davies calls back over he radio and reports that the cable d box is alight and burning the pole. he fire brigade is called to deal with is. Keogh is instructed "to open air reak 394 and meet the firemen on the ob," whilst Davies carries on with the ob of restoring supply to the other distributing centres affected. His instructions are "Clear pts. 419 and 171, open air break 205, and close Killara feeder at Pymble." He reports at 3.45 p.m., "Davies to VKK, pts. 419 and 171 clear for paralleling, air break 205 open, proceeding to Pymble." This is transmitted to Keogh at Birdwood-avenue. Meanwhile, Foreman Glover leaves to restore supply to pts. 419 and 171, by low voltage paralleling, the fire having been extinguished. Keogh leaves to restore supply to the East Lindfield section. Whilst all this has been going on, District Operator Tressider, due on duty at 4 p.m., has heard the radio instructions, so he speeds up to be in time to assist. Calling VKK, he says, "Leave Lindfield section to me," with the result that all three sections affected are restored by 3.55 p.m. Foreman Glover has paralleled the faulty pole transformers by 4.0, and after routine checking the entire section is restored to normal operation by 4.45 p.m.

Without the radio it would not have been safe to have three men on the one job, but as each man could hear all the instructions, he knew just what was being done, thus avoiding any possibility of any misunderstanding.

Well, that's only a small portion of what is happening from time to time. but there is no doubt that this interesting application of this wonderful radio art of ours is certainly rendering yeoman service to further supplement the efficient operation of the Sydney County Council's Electricity Undertaking.

Science Keeps It Cold With Dry Ice

(Continued from Page 14)

Some idea of the great weight of he substance can be gained when it s considered that a block of it, 10 x 10 x .0 inches weighs in the vicinity of 50lb.

At the factory the storage of dry ice s carried out in specially insulated con- ainers. It is very fascinating to watch he cold "steam" rising from the storage tank when the lid is off.

For the despatch of the dry ice to consumers, heavily padded canvas bags are used, which, owing to the relatively slow vaporisation of the substance, gives sufficient insulation for all purposes.

The plant installed in a Sydney lime company for the manufacture of dry ice uses what is called the carba process. This process is little different to that described, with the exception of the final stage of solidification.

Here the presses are dispensed with, and the "snow" is automatically compressed in the apparatus itself, so that all that is required is the cutting up of the solid block into smaller standard sizes.

The uses of solid carbon dioxide are many and varied. It is used for the cold shrinkage of machine parts, cooling vacuum traps in the manufacture of neon tubes and radio valves, freezing ice cream and foods, chilling of golf balls, drying ether and other solvents by freezing out water, cooling smallgoods and meats during transit to far places, and cooling and holding aluminium alloy rivets, &c.

If you can get hold of a small piece of dry ice, try the following experiment. Place it in a tumbler half full of water. It will boil violently, at the same time emitting a dense cloud of carbon dioxide gas. The water around the "ice" will freeze after a while, and the water finally will taste like soda water, which it really is, being impregnated with the carbon dioxide given off by the "dry ice."

Having now come to the end of my tether, so to speak, I trust that readers will have gained a little knowledge on the subject. But there is one thing I would request of you. Please don't write to me for constructional details of a complete dry ice plant. If there is any information of a technical nature that I can supply, please write. One never knows. But, as for building one, oh, no!

MISCELLANEOUS

TAP.—9465kc., 31.7m., Ankara, Turkey. When not interfered with by some deliberate form of "hash," comes in well till 7.30 a.m. (Cox, Harris, Clack, Elliott, Silverthorne, Medina, Foster.)

TAQ.—15,195kc., 19.74m., same location. This one is very faint, but can be heard till 10.30 p.m.

CSW4.—15,215kc., 19.71m., Lisbon, Portugal. Still a very loud station from 2.0 a.m. (Medina.)

CSW5.—11,040kc., 27.17m., same location. This station is now fairly weak in the early hours. (Medina, Gaden, Foster.)

CSW7.—9740kc., 30.8m., same location. A really excellent station in the mornings around 7 a.m. (Medina, Gaden, Silverthorne, Foster, Harris, Elliott.)

HVJ.—11,740kc., 25.55m., Vatican City. This station has been heard at very good strength on Tuesdays at 11 p.m. (Medina.)

HVJ.—6190kc., 48.47m., same location. On a Monday morning between 4.30 a.m. and 5 a.m. is a very loud signal. (Foster.)

HVJ.—15,120kc., 19.84m., same location. Another early morning station on a Monday from 4 a.m. till 4.30 a.m.

YUC.—9505kc., 31.56m., Belgrade, Yugoslavia. This one is hard to hear now, due to XGOY and GSB. (Medina, Gaden, Foster, Harris.)

PCJ.—9590kc., 31.28m., Huizen, Holland. Heard on Monday mornings till 6.0 a.m. and on Wednesdays till 6.30 a.m. (Silverthorne, Clack.)

PCJ2.—15.220kc., 19.71m., same location. Quite a good station every night from 10.40 p.m. (Medina, Silverthorne, Harris.)

PH12.—17,770kc., 16.89m., Huizen. Heard regularly on Sunday from 9.40 p.m., and occasionally other nights, interfered with by TPB3. (Medina.)

LYR.—9290kc., 32.29m., Kaunas, Lithuania. Has improved greatly, and now heard well on Sundays from 11 p.m. (Gaden, Cox.)

LKQ.—11,735kc., 25.27m., Oslo, Norway. This one can just be heard on most nights from about 9.0 p.m. (Gaden, Cox.)

HAS3.—15,370kc., 19.52m., Budapest, Hungary. On Sunday night at midnight this station can be tuned in at fair level. (Silverthorne.)

SBT.—15,155kc., 19.8m., Motala, Sweden. Opens on Sunday nights at 6, when it is quite fair strength. (Cox, Foster.)

SBP.—11,705kc., 25.63m., same location. Also on the air at the same time as SBT, but not as strong. (Cox, Foster, Harris.)

ORK.—10,330kc., 29.04m., Ruysselede, Belgium. This station can be heard every morning until closing with "La Brabanconne" at 6. (Cox.)

YUB-YUA.—6100kc., 49.18m., Belgrade, Yugoslavia. Mr. Cox in N.Z. has heard this one in the late afternoon. (Gaden.)

Radio Sofia.—10,310kc., 29.09m., Sofia, Bulgaria. This is the station mentioned in separate article.

OZU.—7260kc., 41.32m., Skamlebaek, Denmark. Another new station now audible after JVW closes at 7 a.m.

ZAA.—7850kc., 38.25m., Tirana, Albania. This little heard station has been heard by Dr. Gaden.

ANSWERS TO CORRESPONDENTS

UNDER THE PERSONAL SUPERVISION OF THE EDITOR

M.C. (Cook's Hill).—All we can suggest is that probably your locality is not a good one. Perhaps your aerial and earth or phones are at fault. Suggest you carefully check these.

F.W.H. (Atherton).—If the short-wave coil is wound exactly as described in the article with 26 gauge D.C.C. wire, you should be able to cover the 16 and 20 metre bands quite satisfactorily. We doubt whether the set would be efficient as low as 10 or 13 metres. However, you could experiment with various coil windings, varying the grid turns to see what are on these bands.

A.R.P. (Port Moresby) wants operating characteristics of 6R7 valve.

A.: The operating characteristics for the 6R7 valve, which is a Duo-Diode-Triode, are: Heater, 6.3 v. at 0.3 amps; plate voltage, 250 v.; neg. grid bias, 9 volts; normal plate current, 9.5 m.a.; amplification factor, 16; A.C. plate resistance, 8500 ohms; optimum plate load, 10,000 ohms; transconductance, 1900 microhms; power output, 0.28 watts; cathode bias resistor, 950 ohms. The connections to the base are as follows: Looking at the octal base with the key facing you, the first pin on the left has no connection. Following the other pins around in clockwise direction, they are 2, heater; 3, plate; 4, diode plate 2; 5, diode plate 1; 6, no connection; 7, heater; 8, cathode. The grid is connected to the cap at the top of the valve.

R.W. (Kogarah).—The coil box used in the converter published in "Wireless Weekly." December 14, 1934, was a commercial unit, and we have no details of the windings. However, we would like to mention that an excellent short-wave converter was described in December issue of "Radio and Hobbies." This is the latest design and is much superior to any of our previous converters. If you require this issue we will forward you one immediately on receipt of 9d in stamps.

SATISFACTION and COMPETITIVE PRICES with your orders at

COOKE BROS.

Pty. Ltd.

483 Kent Street Sydney

Wholesale Distributors of Radio and Electrical Goods and Accessories, including Kit parts for all R. & H. Circuits. Distributors of Musical Instruments, including "Maxitone" Electric Amplifying Guitar.

H.H. (Rockhampton) asks a few questions about the electric fence.

A.: Without actually taking measurements it is difficult to say what voltage would be in the fence using a 6-volt accumulator. The length of the fence, &c., would cause this to vary, but in any case would probably run into several thousand volts. The voltage necessary to kill a dog, &c., is hard to estimate, as it would depend on the current flowing through the circuit. However, using the fence with a 6-volt accumulator does not deliver enough current to kill an animal nor give any dangerous shocks. It is not possible to use this unit for charging batteries. By the cone central angle we presume you mean the angle formed by two sides meeting at the voice coil. This angle can easily be measured with a protractor.

YOUR QUERY ANSWERED FOR A SHILLING!

In response to many requests, we have decided to re-introduce the Shilling Postal Query Service. This means that if you want your queries answered by mail, send 1/- Postal Note or Stamps, and you will receive your reply within a few days.

The fact that Radio and Hobbies is published monthly means that without such a service, urgent queries could not be answered, possibly for several weeks, through the columns of the paper.

Make your questions as clear as possible, and if you can, group them together at the end of your letter. This makes it much easier for us to answer them.

If you send a Postal Note, make it payable to "Radio and Hobbies." Our address is 60-70 Elizabeth-st., Sydney.

USE THE MAIL FOR QUICK REPLY SERVICE.

R.H. (Red Hill).—Your suggestions are very interesting, and we are giving them our careful consideration. An article on how to make small cabinets for our sets should be very welcome, to many readers. We will try and arrange something of this nature if possible at a later date.

R.E.B. (Canterbury).—Your suggestion for binder covers is quite good, but we think it would cost more to produce than you suggest. In the near future we may be able to finalise something with regard to these binders. Glad you like the paper so much.

P.W.F. (Gayndah).—There was no January issue of "Radio and Hobbies." The Christmas issue was published in its stead.

N.G.J. (Annerley).—The statement on directional aerials could be generally accepted as correct. However, it should not be assumed that it would hold for other types of aerials. Since our space in this column is limited, we are not able to discuss the "whys" and "wherefores" of these aerials in full detail.

E.J.T. (Goodwood).—Many thanks for your appreciative remarks about the paper. From our experiments with the electric fence we have found there is quite a "bite" in the wire. We may be able to publish some further experiences later.

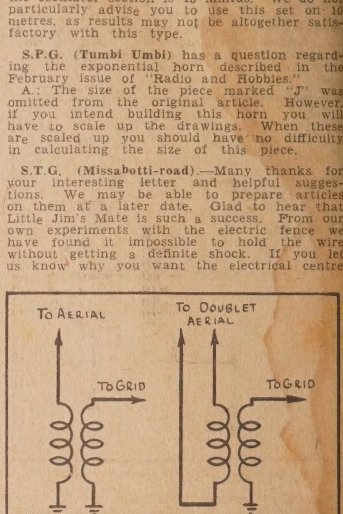
J.W.E. (East Melbourne) wants to know the capacity of the tuning condensers used in the 2JU Special Six.

A.: All the bandspread condensers are 100 mmfds. capacity. The small ones wired in parallel with these are 15 mmfds. capacity, except for the oscillator section, which is 100 mmfds. The small vernier condenser used in the oscillator section is 15 mmfds. We do not particularly advise you to use this set on 10 metres, as results may not be altogether satisfactory with this type.

S.P.G. (Tumbi Umbi) has a question regarding the exponential horn described in the February issue of "Radio and Hobbies."

A.: The size of the piece marked "J" was omitted from the original article. However, if you intend building this horn you will have to scale up the drawings. When these are scaled up you should have no difficulty in calculating the size of this piece.

S.T.G. (Missabotti-road).—Many thanks for your interesting letter and helpful suggestions. We may be able to prepare articles on them at a later date. Glad to hear that Little Jim's Mate is such a success. From our own experiments with the electric fence we have found it impossible to hold the wire without getting a definite shock. If you let us know why you want the electrical centre



of a piece of wire we may be able to help you. At the present there is not enough information. The accompanying sketch will show you how to connect a doublet aerial on to your set. One lead is connected to the usual aerial terminal. The other lead is connected to the other end of the primary winding of the aerial coil. This is the end that is normally earthed.

W.P. (Banyo).—The figures we mentioned for the 6L6G are only average values, and will probably vary slightly with different makes of valves. The exact bias resistor should be 175 ohms if you are keen to follow specifications exactly.

F.B. (Midland Junction).—There was no January issue of "Radio and Hobbies." The Christmas issue was published in place of it. Although all our circuits are rechecked before publishing, sometimes small errors creep in. We are pleased to hear you like reading "Radio and Hobbies" so much, and hope you may be tempted to try your hand at some of the circuits.

M. McM. (Red Hill).—The circuit of your telephone system appears quite suitable. We could not suggest any further improvements as in its original form it seems quite simple and efficient. Glad you like "Radio and Hobbies."

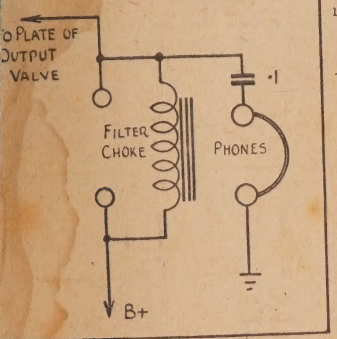
R.B. (Belmont).—Without actually seeing the circuit, it is hard to determine the cause of the trouble. If you can let us have a copy of the circuit we may be able to help. We might point out, however, that a crystal set needs an exceptionally good aerial and earth. A suitable aerial should be approximately 60 feet in length, well insulated, and erected as high as possible from the ground. It should be kept clear of any trees and buildings, otherwise some of the signal energy will be absorbed by them. The reason a good aerial is required is that the crystal set has no means of amplifying the signal, and consequently needs all the energy the aerial can supply.

W.H.P. (North Hamilton) wants to know how many hours a standard 1.5v. cell with a drain of 3.5 amps. will last.

A.: In this case we think you mean a drain of .35 amps. This is approximately the normal drain for this type of cell. Under these conditions the cell should give about 55-60 hours of service. Although theoretically the cell should last about five hours with a drain of 3.5 amps., you would find in practice that it would short-circuit itself in a few minutes. The reason for this is that the cell is not built to stand such an excessive current drain.

e system is approximately 180 pounds to quare inch. The pressure drops when ame is out. (3) The hydrogen is con- to the one side of the evaporator in to balance the pressure created on the side. If there were no counter-balance iquid ammonia would be forced straight gh the evaporator before it had time to orate. Hydrogen is used as it is insoluble ater.

C. (Mosman).—You seem to be mistaken ding the pressure in the gas refrigera- It is not low. The process of boiling es a pressure of approximately 180 pounds ne square inch. All gases can be liquified pressure. Although a certain amount of is generated by compression this is dis- ed by means of cooling fins around the . Liquid gas is not cold. Cold is only uced when the gas is allowed to expand evaporate. This is what it does in the orator.



ow to fit an output filter for use with headphones.

"Curious" (Harrisville).—The number of ocks per second in the wire can be varied adjusting knob "A" in the diagram. If is is screwed in the number of shocks per cond will increase, whereas if it is loosened ic pendulum will have a longer swing, and onsequently less number of shocks. With the endulum swinging slowly the shocks will be ore severe than with it moving faster.

T.P. (Sth. Grafton).—The Duplex Single escribed in the Christmas issue of "Radio nd Hobbies" should be quite suitable to build. his is a one-valve set capable of both broad- ast and overseas reception.

R.J. (Mundubbera).—Since you are so far rom any broadcasting station, Little Jim's late or the Duplex Single would probably e too small for you. The small 2-valve set escribed in this issue should be a much etter performer. Although only using two alves, it is equal to a 3-valve set. Any of .e advertisers in "Radio and Hobbies" would ve a price for the parts.

B.M. (Footscray).—The gauge wire for the Duplex Single coils is 26 gauge D.C.C. for the short-wave and 32 gauge enamelled wire for he broadcast coil. The R.F. choke would e suitable to use. The .1 condenser must be ncluded in the circuit. It was missed out of he parts lists in error.

W.T.C. (Murwillumbah).—We suggest you write direct to any one of our advertisers for a price of the Duplex Single parts. The prices now have a tendency to fluctuate, and these are the only people that can give you a correct price.

N.J.G. (Annerley).—It is not absolutely necessary to use an earth with Tiny Tim. However, should you prefer to use one, it can e quite easily fitted. At the present we have o plans for a 3-valve T.R.F. set using the 1.4 v. valves. We might mention that in the September issue we described a 4-valve T.R.F. set for short-wave reception. Possibly you could adapt this to suit your purpose.

W.A.B. (Dandenong).—The Duplex Single coils are wound with 26 gauge D.C.C. wire for the short-wave, and 32 gauge enamelled wire for the broadcast coil. Many thanks for your appreciative remarks.

W.T.L. (Sandford).—You can obtain the valve characteristic charts by writing to the Amalgamated Wireless Valve Co., York-street, Sydney. The other catalogue has been posted to you.

A.E. (Kew, E.4).—The Gwin aero engine can be run in an inverted position, providing it still has the suction petrol feed. However, using the engine in this manner has one drawback. All oil that would normally accumulate in the sump would choke up the spark plug in a very short time. This would necessitate more frequent cleanings, and would probably retard the performance of the engine.

Book Reviews

TWO FINE HANDBOOKS

FROM McGill's Newsagency, of Elizabeth-street, Melbourne, one of Australia's most famous depots for magazines and technical literature, we have received copies of the two most famous handbooks in the world. Neither of these will need introduction, as previous editions are familiar to many of our readers.

* * *

THE RADIO AMATEUR'S HANDBOOK

THIS is an A.R.R.L. publication, which letters stand for the American Radio Relay League, the recognised amateur organisation of America, which includes over 60,000 American amateur transmitters.

The handbook, while devoted mainly to matters of amateur transmitting, contains pages on radio theory, a complete course in receiving and transmitting which, for its brevity and clarity, has scarcely, if ever, been surpassed.

Each successive edition seems to have still more material included, and, of course, is brought right up to date. The 1940 version is no exception. It has 576 pages, including an excellent section devoted to special short-wave receivers. Altogether there are 32 chapters which seem to cover all there is to know about radio!

One handy chapter we noticed was on workshop practice, in which are included many hints for the assistance of constructors.

The reputation of previous handbooks is more than upheld by this fine 1940 edition.

* * *

THE "RADIO" HANDBOOK

NOT quite as long established as the A.R.R.L. Handbook, but almost equally famous, is this publication of Radio Ltd. It is also devoted to amateur transmitting, and is a more practical type of book than the A.R.R.L. production. By this we mean it covers constructional work almost exclusively, with its radio theory more concisely stated. It is crammed with designs of receivers and transmitters, and abounds in interesting gadgets for improving existing equipment.

The chapter on receivers is probably the most interesting in the book, and is an experimenter's paradise. Radio's receivers are so well known that everyone has heard of the "Supergainers," for instance.

Here are little sets, and big sets, all designed for super performance.

We heartily recommend both these books to all radio people, as containing a wealth of radio information in theory and practice.

W.J.W. (Glebe).—Your letter was very interesting. However, offhand we could not advise you of anybody who might be able to assist in your experiments.

T.H.B. (Launceston).—The sketch of the wiring is correct except for one lead. The lead marked yellow from the O.G. lug of the 6K8G to the O.G. connection on the coil should be connected to the other end of the .0001 condenser, and not direct to the socket lug.

M.J.S. (Grafton).—Many thanks for your interesting letter. If the measurements for the 4/39 were the same as in the article, you should have had no difficulty in fitting the chassis into the cabinet. The cabinet measurements were taken from the original set, and this fitted in perfectly. The Portable Set will not be entirely satisfactory to use in a car with only the loop aerial. However, we have found that excellent reception can be obtained by using a "fish" pole aerial attached to the back of the car. The transformer coupling could be used similar to the Pentagrid Three, and should give excellent results.

J.S. (Mackay).—Many thanks for your kind remarks about the paper. Your suggestion is quite good, and we may be able to use it in a later issue of "Radio and Hobbies."

C.R.E.G. (Gayndah).—The converter would not give as good results as a modern dual-wave receiver. It is difficult to say which would be the best aerial for DX-ing. However, without resorting to complicated designs, we would say that the one you are at present using would be hard to beat. We may be able to publish an article on aerials in a future issue of "Radio and Hobbies." The vibrators have proved quite successful in battery sets. Many thanks for your kind remarks, and glad to hear you like the paper so much.

"Radiotron Designers HANDBOOK
Price 3/4 Posted
McGill's Agency
183-185 ELIZABETH STREET, MELBOURNE.
(The G.P.O. is Opposite.)
Send for our free catalogue on all technical subjects.

"Radio Amateurs' HANDBOOK"
Price 10/-
Plus 10d Postage.
McGill's Agency,
183-185 ELIZABETH STREET, MELBOURNE.
(The G.P.O. is Opposite.)
Send for our free catalogue on all technical subjects.

Jones Radio HANDBOOK
Price 12/-,
plus 10d Postage
McGill's Agency,
183-185 ELIZABETH STREET, MELBOURNE.
(The G.P.O. is Opposite.)
Send for our free catalogue on all technical subjects.

K.K. (Adelaide) writes as follows: "I have just completed your cute little set, 'Tiny Tim.' It went first go and it's all that you say it is. I live exactly four minutes from the aerials of 5AD, KA, AN, all powerful transmitters, and yet 'Tim' separates them day and night. Truly an achievement for such a modest set as 'Tim.' The two tappings on the aerial coil are a great help in that respect. The tone is remarkable for such a tiny set. I have it in a good solid oak cabinet, and everybody who has heard 'Tim' remarks on the good tone. I used a 42 in place of the 6F6, and cut off some of the highs with a .0006 condenser. So altogether I'm very glad I built 'Tim,' and can recommend him as first-class." (Such letters as this are being received every day, and they prove that "Tiny Tim' is even more popular than we expected.)

N.R.W. (Cowra).—Many thanks for your interesting letter and suggestions. We may be able to use them later. Glad you like "Radio and Hobbies."

R.H.I. (Ibilbie) has a question on the 4 valve R. & H. Portable.

A.: Your main trouble appears to be audio feedback. We suggest you carefully shield all the wires to the volume control. This should eliminate most of the noise. An extra precaution would be to wire in a .0025 bypass condenser from the plate of the 1H5G to earth. This set will not work satisfactorily from one "B" battery.

L.H. (Scarness).—Since the set operates on the broadcast band so well and not on the short-wave, the 2A7 may be at fault. We suggest you try another 2A7 in the set. If this fault still persists, then the best thing would be to send your coils back to the makers for rechecking. The advantage of push-pull output is that it allows us to work the valves at a higher output without producing distortion.

K.P. (Howqua).—We would be interested to inspect an article on the wind-driven generator. Such an article should be of interest to many country readers. Most of the articles we have previously read on this subject have either been too complicated or too expensive to build. We doubt whether 70 volts in the electric fence would have any effect on animals, unless a very high current was present. The output from the coil in the fence described in "Radio and Hobbies" is in the vicinity of several thousand volts. Since the current flow is extremely low, it is not dangerous to operate.

"Arido" (Hamilton).—The small set published in this issue should interest you. This is basically the Duplex Single circuit with an R.F. stage added. It is really equivalent to a 3-valve set, although only two are used. Actually, we have not yet tried a dual-wave bracket in the Pentagrid Three. However, since it performs so well on the broadcast band, there is no reason why it would not perform well on the short waves if a suitable unit was used. There's no harm in trying it.

G.R.L. (Julburgh Station).—Many thanks for your very interesting leter. We are glad to hear that the Economy Seven is performing so well out in the country. The 1B7G should be a better oscillator than the one you are using. However, since we have not actually tried it out, we cannot vouch as to its performance. Since your other valve is not oscillating properly, are you sure the coils are not at fault? It would probably be better to check these before buying any new valves. Your suggestion re the noise suppression article is quite good, and we may be able to do something about it at a later date.

W.P.B. (Ryde).—We would not advise you to rebuild the set into a dual-wave receiver. It is rather an old model and very few of the parts would be suitable to use with a modern type of coil kit. Also these rebuilt sets very rarely perform as good as they should, and are often a source of trouble.

"Pentagrid Portable" (Maryborough).—You may be expecting too much in trying to pick up stations 150 miles away with the loop aerial in the Portable Set. The loop aerial is only suitable to be used near the local stations rather than for distance reception. Are you using two high-gain intermediates? Possibly you have the low-gain types in your set—this would affect sensitivity a good deal.

R.W. (Coburg).—Many thanks for your encouraging remarks. Offhand, we have not any circuits on hand similar to those you require.

P.R.L. (Middleton Beach).—Your list of stations received on the Duplex Single is quite interesting. You could not add an output stage to the 1D8GT, as this valve is essentially an output valve. The small set described in this issue should interest you. It uses the 1D8GT as output valve and has an R.F. stage added.

E.C.B. (Mildura).—There was no January issue of "Radio and Hobbies." The Christmas issue was published in its place. The elementary radio course dealing with valves, &c., commenced in the December issue of "Radio and Hobbies." Apparently you have missed this copy. Increasing the "B" voltages on Little Jim would improve the performance. However, if you are using headphones we would not advise you to apply more than 60 volts. This gives quite enough volume for headphones. Also if the voltages are increased too high the bias would have to be changed. Glad you like reading "Radio and Hobbies."

B.W.B. (Coraki).—A 180 mmfds. condenser connected in series with the .000385 mfds. will give you the required capacity. However, you may be only able to buy a 200 mmfds. but this will make little difference. It could be connected in series between the fixed plate of the tuning condenser and G on the coil. More gain can be obtained from the 34 if used as a pentode with choke coupling than as a triode.

SHORT-WAVE QUERIES

Mr. H. R. Cox (Cobden, N.Z.).—Glad you received letter and thanks for any information from the N.Z. Broadcasting Board. Will mail this issue the day of issue, also the rest, as you suggest. Hope you will have a try at the competition, as your results should give you a good chance. Second letter received March 9.

Mr. R. K. Clack (Chester Hill, N.S.W.).—Let us hope that from now on we can be successful in having your reports acknowledged in the proper issue. Have already answered you with regard to the aerial problem, which I trust was of some use. Your station on 6700kc. (actually 6690kc.), would be TIEP, which is heard now from 10 p.m. at fair strength. Kind regards till next time. Hope your receiver will soon be operating again, so that your reports will continue.

Mr. H. E. Parsons (West Pingelly, W.A.).—Glad the broadcast band information was a help. The reason the American amateurs are heard better than the commercials is due to the fact that the former use directional beam antennas, beamed on the station they are working, while the commercials are usually beamed either on Europe or South America. (KGEI is an exception as they have an Asian beam.) In addition, if the regular short-wave stations worked at all the unusual times followed by the amateurs they would quite likely come in better. For example, during the first few days of the war the American stations came in at excellent strength when they were transmitting in the late afternoon (our time).

Mr. A. W. Harris (Benalla, Vic.).—I have answered your various queries by mail, which you will have received before this. As you will see by this issue the various Central and South Americans are now coming in quite well in N.S.W., and probably in Victoria, too.

Mr. W. Silverthorne (Port Augusta, S.A.).—Many thanks for your nice remarks which are greatly appreciated, as we try to make our notes the best we are able to. You are certainly doing well with your verifications which we notice include Radio Saigon, JVW3, HS8PJ, WGEA, WGEO, VLW, EAQ, TGWA, XGOX, XMHA, 2RO3, 2RO9, MTCY, JZK, WROA, WOAB, and WCBX. Keep up the good work.

Mr. George C. Steffan (Bundaberg, Q.).—Your reception report has been included in this issue, and we have already written you in regard to the station addresses. Very pleased to hear you like our short-wave notes so much. Will try to include more addresses in future. Stations which verify can be found from the regular monthly feature, "This Month's Verifications," but we will also mention where possible in the "Listen for These" pages.

Mr. H. Medina (Waverton, N.S.W.).—Your queries have been answered by mail, and your excellent report incorporated in this month's notes. In your next letter please let me know what you think of the competition rules, will you? Judging by your report you have been burning some midnight oil, but to good effect, as your list proves.

Dr. K. B. Gaden (Thargomindah, Q.).—Very pleased to receive your reports once again. Yes, the U.H.F. channels seem to have closed up once again. You still seem to do better than we do in N.S.W. with some of the stations on the other bands, however. Looking forward to hearing from you again next month.

Mr. B. W. Battis (Coraki, N.S.W.).—Very pleased to get your usual comprehensive report and also glad to know you received your QSL card from PMY, as we believe they are somewhat hard to get. Also much obliged for the information re the new Chinese stations which are included in this issue. Items like these are always of interest for publication in our notes.

Mr. N. Gee (Sydney, N.S.W.).—Was pleased to hear from you, and am obliged for the information re the Ci. station, XGOY, on 31.1m. These Chi- stations are always hard to keep track Personally, I can always make more sen out of the Spanish-speaking stations th the Orientals.

Mr. W. Page (Narromine, N.S.W.).—Very n... thanks for the nice remarks you made re th short-wave pages, and glad to know ye enjoy them. Yes, it is somewhat a diffic now to obtain verifications from some coun tries, but there are always a few turnin up. We have answered your other queri re receivers by separate letter, which ye will have received before you read this. Pleas write again at any time.

Mr. Alan F. Elliott (Ascot Vale, Vic.).—We come to our pages, Mr. Elliott, and ma thanks for your report, which is acknow ledged this month. Your station just abo GSB on Sunday afternoons would definit be XEWW in Mexico City, as they come at great strength at that time. Plea write again next month, and give your r port on receiving conditions.

Mr. M. Foster (Mount Vincent, N.S.W.).—Ye will have received a letter before this answe ing your queries. Very glad to hear you w be a competitor in the competition, as th more readers that enter, the greater th interest will be. Listen for the other ne Spanish-speaking stations listed in this issu

Mr. L. K. Collier (Toronto, N.S.W.).—You query re the stations which transmit morse has been answered through the ma as requested.

Mr. R. Kemsley (Prospect, South Aust.).—Th addresses which you required have been sen on to you by mail as requested.

BARGAINS GALORE FOR 19-

VALVES: 6A7, 6B7, 84, 6D6, 1C4, 1C6, 1A6 26, 8/6 each. A615, 609, 171A, 630, 55, 6415, P424, 7/6 each. 201A, 27, 5/6 eac R.S.S. Super Crystal, 1/-. "B" Battery Elim ators from 12/6 to 27/6. Bus Bar, 10d d lengths. Grid Leaks, 6d. Pilot Bulbs, 3 Hook-up Wire, 14 yds., 1/-. Variable Co densers, from 1/6 to 4/6. Thousands of oth Bargains. All guaranteed. Add postage.

RADIO SUPPLY STORES
7, ROYAL ARCADE, SYDNEY.

SERVICE MEN AND SET BUILDERS

We can supply anything you require in Radio. We carry stocks of all radio parts and can supply kits of parts, completely built chassis or sets in cabinets. Our prices are the lowest offering. If you want quality goods, low prices, and personal service, get in touch with us.

DAVIS RADIO CO.

WHOLESALE RADIO DISTRIBUTORS
First Floor, Wembley House,
841 GEORGE STREET,
SYDNEY.
Open Friday Nights till 8.30.
'Phone M3917.

Printed and Published by Associated Newspapers Ltd., at the registered office of the Company, 60-70 Elizabeth-street, Sydney.